

ELECTRICAL CONSTRUCTION AND MAINTENANCE

SEPTEMBER • 1950

49th Year

Moving

Electrical problems of plant relocation.

Flexibility

Bus circuits give layout flexibility in industrial plants.

Estimating

How to appraise labor units and cost data.

and Featuring

Recording Instruments

Beginning of a new series on the application of recording instruments to operation and maintenance.

A
McGRAW-HILL
PUBLICATION

\$1907⁰⁰
HERE
SAVES
\$2700⁰⁰
A YEAR



COMPLETELY PAID OFF IN EIGHT MONTHS—that's the experience the Empire Plow Company of Cleveland, Ohio, had when they installed two 90-kvar and two 30-kvar banks of General Electric capacitors on their power distribution system.

The power factor had been down to a money-wasting 61%. After the capacitor installation it rose to better than 97%. With new power rates becoming effective—rates that contained a power-factor penalty clause—improvement in power factor meant real savings in the power bill. The entire installation—capacitors, switches and labor—cost \$1907. The savings have been \$2700 in the first year alone.

DO THESE FIGURES SOUND GOOD? A quick check of your own power factor may show that you can do the same. If your power factor is below 85%, chances

are you can make worthwhile savings—especially if there is a power factor or demand clause in your power contract. Also, capacitors will usually improve voltage conditions, allow for expansion of your electrical load, and relieve feeders and transformers of overload.

Your nearest G-E Apparatus office can help you determine just what savings G-E capacitors will make for you—and what improvements in voltage and overload conditions. Meanwhile, read what capacitors have done for others. Write for a copy of GEA-5167, "A Way to Cut Power Cost." Address Apparatus Dept., General Electric Company, Schenectady 5, N.Y.



You can put your confidence in—
GENERAL  **ELECTRIC**
 407-196



Give me those **WIDE OPEN SPACES**

"DON'T CRAMP MY STYLE WITH
KNUCKLE SCRAPERS . . . GIVE ME
Murray Boxes . . . THEY'VE
GOT PLENTY OF WORKING SPACE"



**MORE THAN 6 INCHES
LONG AND WIDE!**

**The "9600" Line of
Meter Connection Boxes**

These Murray Meter Connection boxes are suitable for both indoor and outdoor use. Plenty of room for quick, economical wiring. They eliminate knuckle-scraping and save money usually wasted in lengthy installation time.

Greater depth and width provide 20% more wiring space. Only one seal is needed—hinged sealing cover does away with sealing studs and bar. Box and cover are of raintight construction.

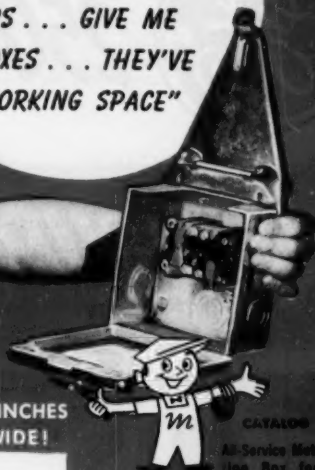


Furnished in Aluminum.

MANUFACTURING CORPORATION
1250 ATLANTIC AVENUE • BROOKLYN 16, N. Y.

SERVICE ENTRANCE & METER EQUIPMENT • MAGNETIC CIRCUIT BREAKERS
SWITCHES • CURRENT LIMITING REACTORS • CROWS' NEST AERIAL LADDERS

WRITE FOR BULLETIN 501B



CATALOG NO. 9600

All-Service Meter Connection Box for Modern
Bottom-Connected Type
Meters.



Plenty to choose from:

- 9600-1—Farmed copper connections and four test fittings. Porcelain block.
- 9600-2—Same except bakelite block.
- 9601—Four nut-type disconnects, four No. 6 copper loops. Porcelain block.
- 9602—Four test fittings, 3 terminal neutral strap. Porcelain block.
- 9602A—Same except bakelite block.
- 9602B—Four nut-type disconnects, four No. 6 solid copper loops, 3 terminal neutral strap. Porcelain block.
- 9603—Same as 9602B except two 60-ampere 2-strap test block with nut type disconnects.
- 9604—Same as 9602B except two 100-ampere 2-strap test blocks and four No. 4 solid copper loops.

NEW! NEW! NEW! NEW! NEW!



250^{AND} 600 VOLT FUSES

INTERRUPT 100,000 AMP!



Type EJ-6 fuse rated 250 volts a-c, 30 amperes (actual size)

Section P 856-30
Apparatus Department
General Electric Company
Schenectady 5, New York

Please send me your bulletin, GET-1819, that describes the new Type EJ-6 Current-limiting Power Fuse.

Bulletin needed for: ☐ Reference purposes ☐ Planning immediate project

NAME (Please Print)

POSITION

COMPANY

CITY ZONE STATE

**...AND THEY'RE LISTED BY
UNDERWRITERS' LABORATORIES**

These new General Electric Type EJ-6 current-limiting power fuses are for application on 600-volt a-c (and below) circuits where the short-circuit current may reach 100,000 amperes. You get increased protection when you use EJ-6 fuses.

RATINGS Standard NECS size fuses are available in 30, 60, 100 and 200 ampere sizes in both 250- and 600-volt ratings. All ferrules and blades have silver surfaces to reduce contact losses. Fuses will interrupt 100,000 rms amperes total asymmetrical current including the d-c component of fault current.

FUSE CLIPS The new EJ-6 fuses are designed to fit standard NECS fuse clips. Also available are special-design clips that prevent the insertion of other NECS fuses. Short-circuit stresses cannot jar fuses loose from these clips. Protect your equipment and personnel by allowing only fuses of high interrupting capacity to guard your circuits.

For additional information on these new fuses ask your G-E Sales Representative for a copy of publication GET-1819 or use the handy coupon. Apparatus Dept., General Electric Co., Schenectady 5, New York.

GENERAL  ELECTRIC

ELECTRICAL CONSTRUCTION AND MAINTENANCE

*With which is combined the Electrical Construction, The
Electrical and Mechanical News, and Electrical News*

Published for electrical contractors, industrial electricians, engineers, consultants, inspectors and motor shops. Covering engineering, installation, repair, maintenance and management, in the field of electrical construction and maintenance.

49th Year—SEPTEMBER • 1950

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New!



MOTOR STARTERS



5 reasons why

R. S. PYNE, THE VAN NORMAN COMPANY,



Mr. Pyne: *"The one thing my machine-tool customers want in a starter is durability. It's got to stay on the job year in and year out. And that, without a lot of expensive maintenance, too."*

Then they want that starter you're about to take apart, Mr. Pyne. It's the new General Electric a-c magnetic motor starter—and it's plenty rugged. Let's start with that coil in your hand.

GENERAL ELECTRIC

730-11

G-E starters last longer!

PROVES IT FOR HIMSELF WITH THE SCREWDRIVER TEST



Mr. Pyne: "Looks different. What's it got?"

1 That coil—we call it the "strong box" magnet coil—lasts two to five times longer than a conventional coil. Suppose the electrician's screwdriver slips and hits the coil. The windings can't be damaged because they're firmly locked in a block of molded plastic.



Mr. Pyne: "Will these terminals work loose?"

2 Not a chance! They're permanently anchored in the coil enclosure so they can't loosen, even after years of operation. You'll notice they're on the front of the coil, too. That makes for easier servicing.



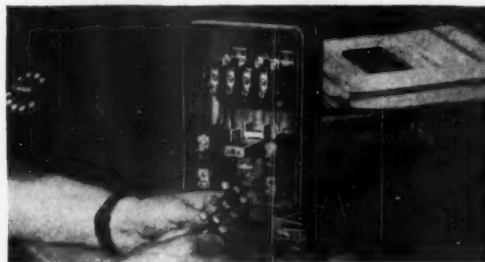
Mr. Pyne: "This magnet moves smoothly enough."

3 Yes—and you can be sure it will do just that even after it's been in service for years. That's because the plastic coil block is made with a permanent "molded in" lubricant. No metal-to-metal friction, no bearings to wear!



Mr. Pyne: "Contacts that burn easily seem to be a major headache. How about these?"

4 Under average conditions you can count on these contact tips to stand up even on the toughest "start-stop" service. They're made of fine silver and there's little chance of their welding together thanks to a high initial tip pressure. And the arc hood keeps each tip protected in its own chamber.



Mr. Pyne: "What about corrosion?"

5 No problem at all! All steel parts are zinc plated. The arc chutes are impregnated with a special wax to resist moisture absorption. Finally, the case is coated with a special corrosion-resisting material and painted an attractive gray.

WHY DON'T YOU BUY ONE AND COMPARE



Make the screwdriver test yourself—and see why the new G-E magnetic motor starter lasts longer than any other you can buy. Your G-E representative or distributor salesman can supply you with this new starter from stock in NEMA sizes 0, 1, 2, and 3 for a-c motors up to 50 hp. For a complete description, write for the "tell all" bulletin, GEA-5153. Section 730-11, Apparatus Dept., General Electric Company, Schenectady 5, N.Y.

Who are You?



Contractor?



Architect?



Dealer?



Wholesaler?

Whatever your particular interest in steel switch and outlet boxes, you know the *Quality* that makes Racó products unfailingly dependable, the *Completeness* of the Racó line for all commercial and home wiring jobs. Add to these the *Approval* by Underwriters' Laboratories, Inc. and you have all the assurance you need that Racó is right. All of this is the result of policy—a disciplined resolve to make Racó products the top line in the market.

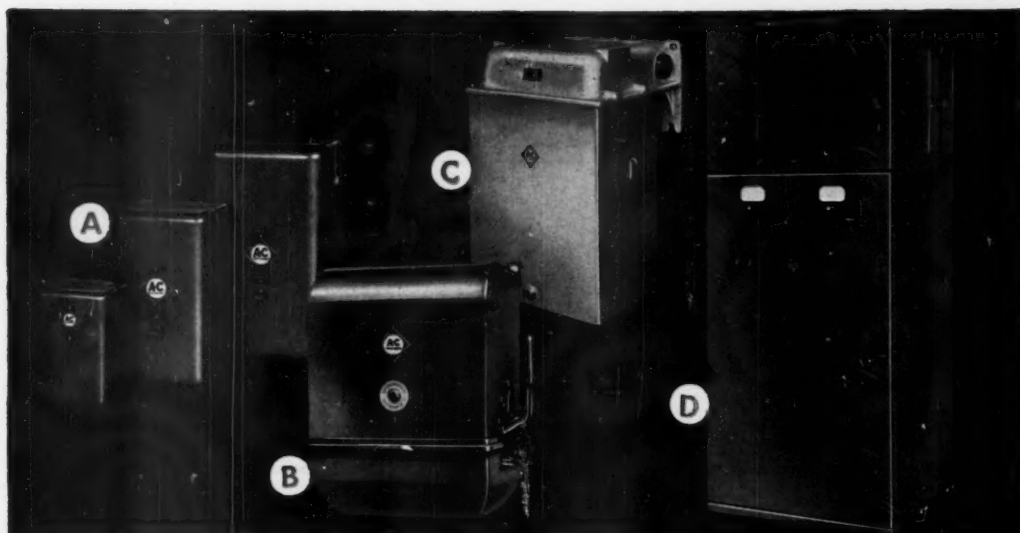
You can always rely on RACÓ

RACÓ

ALL-STEEL PRODUCTS

ALL-STEEL EQUIPMENT Inc. — 800 Kensington Ave., Aurora, Illinois

"A BOX FOR EVERY NEED"



For Squirrel-Cage Motors:

A. FULL VOLTAGE STARTERS in a variety of sizes and enclosures. Send for bulletin 14B7132.

B. REDUCED VOLTAGE STARTERS: Manual and Magnetic Autotransformer Reduced Voltage Starters, and Magnetic Primary Resistor Starters.

C. For FULL VOLTAGE STARTING OF 2300-2500 volt motors of less than 350 hp., Type 371 Starters can be used in dusty, corrosive, hazardous locations. Bulletin 14B7274.

For Wound Rotor Motors:

A wide variety of starters; Manual Primary and Secondary, Magnetic Primary and Secondary, Magnetic Primary with

Manual Secondary, and Drum Type Reversing Primary and Secondary.

D. HIGH INTERRUPTING CAPACITY STARTERS for Squirrel-Cage, Wound Rotor and Synchronous Motors. These starters have current limiting features. They can be connected directly to circuits requiring up to 150,000 KVA at 4160 to 5000 volts without back-up circuit breaker. Bulletin 14B6410A.

THERE IS AN ALLIS-CHALMERS STARTER for Every Motor Need

YOU GET WIDE SELECTION of starter type, size and enclosure for *each* type motor.

YOU GET DEPENDABLE OPERATION! Allis-Chalmers starters are generously designed, durably built.

EASE OF MAINTENANCE results from built-in accessibility of renewable parts.

MANY PROTECTIVE FEATURES! Overload, undervoltage, interlocking and other devices mean greater safety for equipment and personnel.

PLUS BROAD APPLICATION EXPERIENCE
Texrope and Vari-Pitch are Allis-Chalmers trademarks.

ENCE means the *right* starter for *your* job! Allis-Chalmers engineering experience covers every major industry.

REMEMBER, ALLIS-CHALMERS OFFERS BOTH Full and Reduced Voltage Starters for *squirrel cage* and *synchronous* motors as well as control for *wound rotor* motors. Depend on this wide range of starters, backed by industry-wide application engineering experience, for the answer to *your* control needs! Call your nearby A-C sales representative, or write direct for the bulletins indicated above.

ALLIS-CHALMERS, 930A SO. 70 ST.
MILWAUKEE, WIS.

A-3140



Sold . . .

Applied . . .

Serviced . . .

by Allis-Chalmers Authorized Dealers, Certified Service Shops and Sales Offices throughout the country.



MOTORS — 1/2 to 25,000 hp and up. All types.

TEXROPE — Belts in all sizes and sections, standard and Vari-Pitch sheaves, speed changers.



PUMPS — Integral motor and coupled types. Sizes and ratings to 2500 GPM.

ALLIS-CHALMERS

in hotels...



and in cables...

"LONG LIFE IS THE TRUE PROOF OF *Service*"*

* motto of HOTEL GIBSON, CINCINNATI,
celebrating 100 years of hospitality



36 YEARS OF SERVICE is the record of these Okonite cables. Despite puncture in conduit—which was apparently made with a star drill at least 25 years ago—the cables continued to function perfectly although jammed in conduit at that point.

► Dedicated to "that extra service which means so much," Cincinnati's famous Hotel Gibson this year celebrates its 100th Anniversary. Its motto: "Long life is the true proof of service."

In connection with its anniversary, the Hotel Gibson recently made certain wiring changes, necessitating pulling out an amount of the old cable, installed in 1913. Examination showed the cable to be Okonite—in such good condition that it will be re-used.

"Notice how pliable the rubber insulation still is and how it adheres to the well-coated conductor," writes Superintendent Albert Buenger, of the Hotel Gibson. "Conductors, insulation and braid are still in excellent condition. The appearance of this 36-year-old cable is such that anyone would say it had only been recently manufactured. We are planning to use it over again where lengths are suitable, and tests show we'll make no mistake doing so."

Yes, long life is the true proof of service—in cables as well as hotels. The performance record of these and many other Okonite wires and cables proves that using the best cable is always your best policy—and especially in these days of high installation costs. You can get full information on the time-tested features of Okonite insulated wires and cables by writing to The Okonite Company, Passaic, N. J.

THE BEST CABLE IS YOUR BEST POLICY



OKONITE



insulated wires and cables

For Extra Safety and Convenience



USE

**STANDARDIZED
FEEDER DISTRIBUTION
PANELBOARDS**

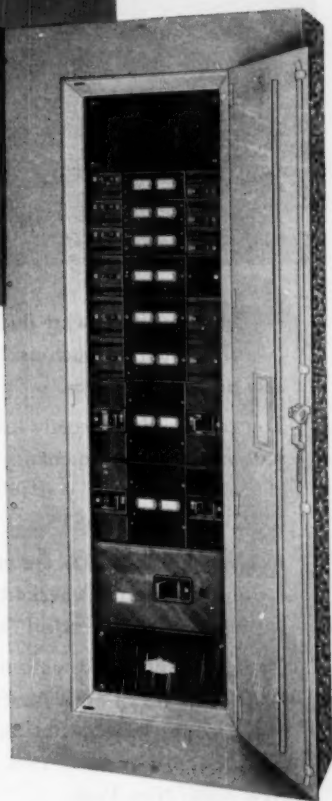
*with automatic
circuit-breaker
protection*

ADD TO **FA** FEEDER PANELBOARDS the extra safety (no overloading) and convenience (nothing to replace) of automatic circuit breaker protection and you have a panelboard that's as popular as it is dependable.

For economy and ease of installation, finished panelboards are built to your requirements using standardized boxes designed to meet any job need. Boxes are shipped from stock... with removable ends to permit drilling conduit openings on the job. Panels are readily installed after boxes are in position.

The circuit breakers, too, are standardized as to dimensions and fastenings, permitting ready interchangeability or replacement. 50 amp. frame size has thermal trip only; 100 amp. and larger have combination thermal-magnetic trip.

Of compact design, minimum space is required for these **FA** Circuit Breaker FEEDER PANELBOARDS without sacrificing capacity or installation features. For complete details, talk it over with your **FA** Representative (he's listed in Sweet's).



Capacities: 15 to 600 amps. in four frame sizes (50-100-225 and 600 amp.), 250 and 600 volts AC or DC. Non-interchangeable trip elements are standard on the two smaller frame sizes; interchangeable trip on all others. This feature is also available in 100 amp. frame on special order at slight additional charge.



Frank Adam Electric Co.

ST. LOUIS 13, MISSOURI

Makers of BUSDUCT • PANELBOARDS • SWITCHBOARDS • SERVICE
EQUIPMENT • SAFETY SWITCHES • LOAD CENTERS • QUIKHETER

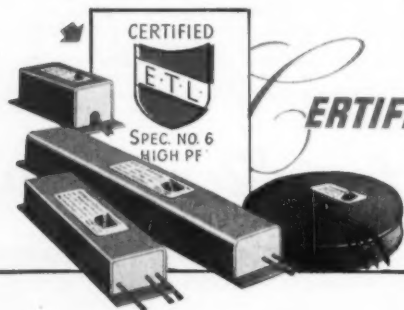
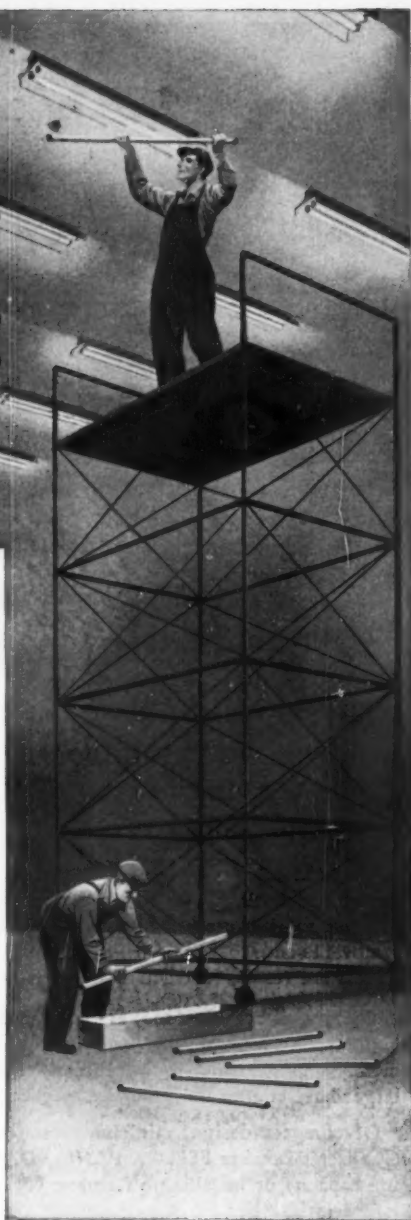
HOW TO GET 1,000 HOURS MORE LIFE FROM A Fluorescent lamp!

THE life of 40-watt fluorescent lamps can be shortened as much as 1,000 hours by improperly designed ballasts.

You can avoid this costly loss . . . save on lamp replacement and maintenance . . . by specifying the ballasts that assure you full rated lamp life . . . **CERTIFIED BALLASTS!**

CERTIFIED BALLASTS are made to exacting specifications, then tested, checked and certified by an impartial authority, Electrical Testing Laboratories, Inc.

Up to the minute information on the types of **CERTIFIED BALLASTS** available from each participating manufacturer may be obtained from Electrical Testing Laboratories, Inc., 79th St. and East End Ave., New York, New York.

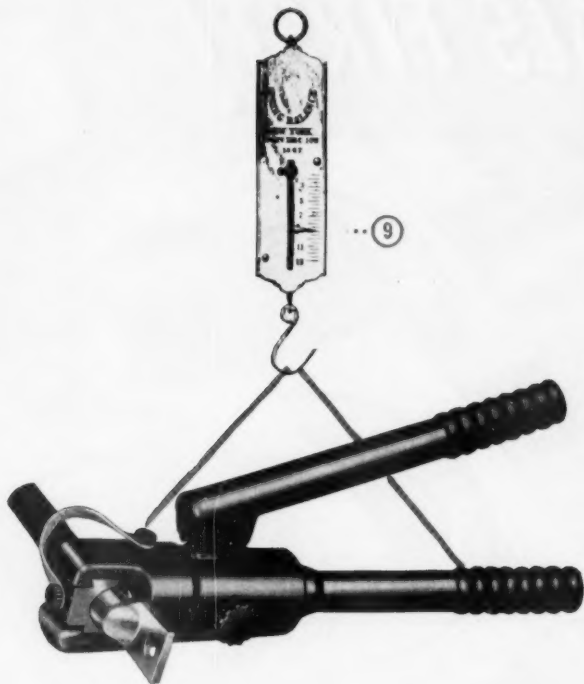


CERTIFIED BALLAST MANUFACTURERS

Makers of Certified Ballasts for Fluorescent Lighting

2116 KEITH BLDG., CLEVELAND 15, OHIO

SKEPTICS:
Young elephants weigh
about 3,000 pounds each



9 pound Hypress exerts 9 ton pressure

You'd naturally expect this superior indent tool from the originators of Hydent indent connectors—Burndy! 19 inches long, light weight, handy to operate, this fully insulated hydraulic Hypress (Y34A) delivers up to 18,000 pounds of pressure with automatically controlled depth of indentation. Assures strong, efficient electrical connections every time.

BURNDY
ELECTRICAL CONNECTORS



HYSPICE

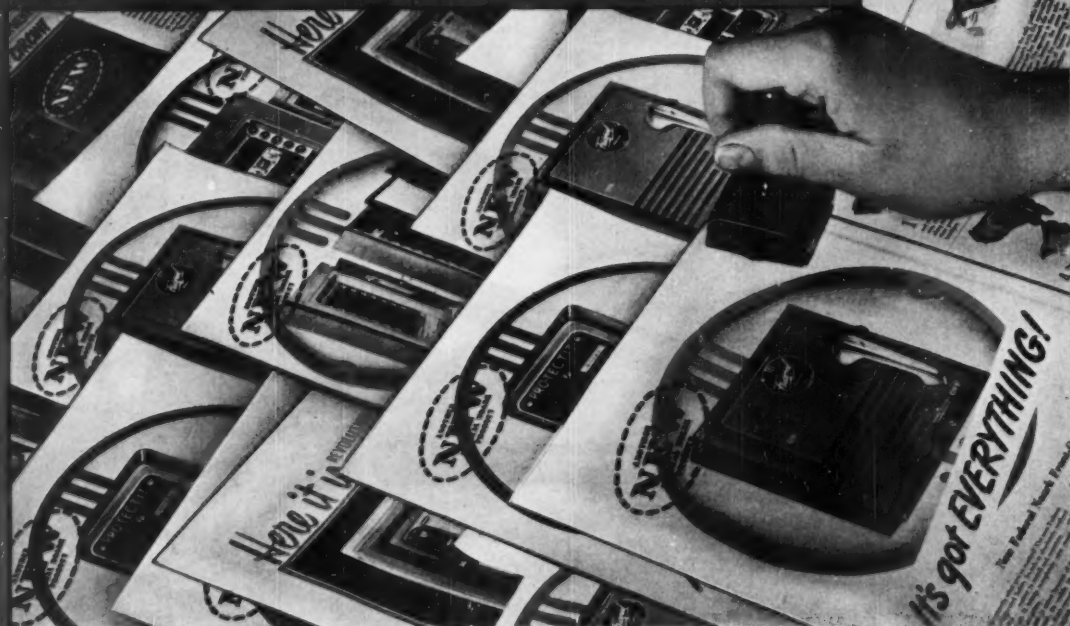
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HYLINK

BURNDY, N. Y. 54, N. Y. • WESTERN BRANCH: VERNON 58, CALIF. • BURNDY CANADA LTD., TORONTO 8, ONTARIO

ELECTRICAL CONSTRUCTION AND MAINTENANCE . . . SEPTEMBER, 1950

FEDERAL'S FIRST!



and here are the reasons why!

IN THE LAST 18 MONTHS, Federal Noark has led the field in introducing new and greatly superior devices in every line of low voltage distribution equipment. Today, the broad scope and outstanding advantages of the Federal Noark lines give you the exact equipment you need for every job...bring you maximum savings of time and money.

Many of these new developments simplify

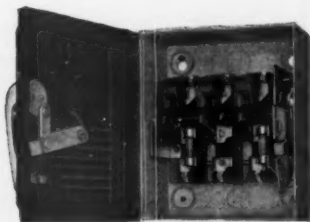
your wiring jobs, too, and reduce your installed costs. And Federal's constant testing and rigid quality control assure absolutely dependable, precision devices, always.

Check into the complete lines of Federal Noark equipment at your nearby Federal Distributor. You'll quickly see why Federal leadership with new product after new product spells top savings and bigger profits for you.

FOR EXAMPLE LOOK AT THESE NEW FEDERAL NOARK

SAFETY SWITCH FEATURES!



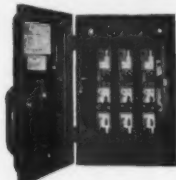


"Type A" Front-Operated
Safety Switch

SAFEST, COOLEST OPERATION

Federal Noark's new line of "Type A" Front-Operated Safety Switches is by far the safest and coolest in operation...gives longest, most dependable service life. They're also the easiest switches to install and maintain... have guaranteed current break...new patented high-pressure fuse holders...only two joints per pole, both of them held under tremendous tension. 30, 60, 100 amp. switches available now.

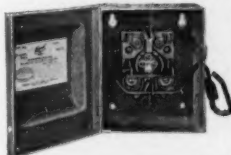
GUARANTEED CURRENT BREAK



"Type C" Front-Operated
Safety Switch

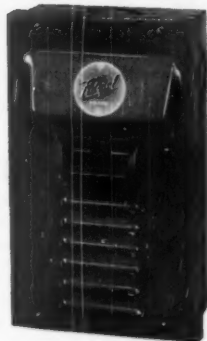
Federal Noark new "Type C" Front-Operated Safety Switches have practically all of the advantages of the "Type A" Switch. Only two joints per pole... new patented high-pressure fuse holder... cross-bar underneath the switchblades which always forces switch open...visible blade construction...smooth mechanical operation. Available in 30, 60, 100 amps.

VISIBLE KNIFE BLADES



30 Ampere Open Knifeblade
"Type D" Switch

With this new Federal Noark "Type D" Safety Switch you can see the blade action. This 30 ampere switch is available in either 1 or 2 pole with solid neutrals. In both, the exact position of the blades can be determined at a glance...a feature that has long been desired by the trade. The new "Type D" also provides ample wiring space. Two pole switches are quick-break, both blades breaking simultaneously.



STAB-LOK
Catalog No. 1125

STAB-LOKS "DOUBLE" AS SAFETY SWITCHES

The new Federal Noark STAB-LOK Circuit Breaker functions as a safety switch and, at the same time, provides today's simplest, safest circuit protection...all at fuse box prices. STAB-LOK Circuit Breakers come in ratings equivalent to 60 amp. fusible switches. Single and simultaneous trip double pole STAB-LOK Breakers available in 15, 20, 30, 40, and 50 amperes as required.



SEND FOR A COPY OF OUR NEW PRODUCTS BULLETIN.



FEDERAL NOARK

Safety Switches

FEDERAL ELECTRIC PRODUCTS COMPANY, 50 PARIS ST., NEWARK 5, N. J.
Complete line of Federal Electric Products includes Motor Controls, Safety Switches, Service Equipment, Circuit Breakers, Panelboards, Switchboards, Control Centers, Bus Duct ★ Sales Offices in principal cities.

Cables run COOLER... in TRANSITE DUCTS



- ... reducing copper losses
- ... increasing current capacity
- ... prolonging insulation life

HERE'S HOW to reduce copper losses... increase current carrying capacity... and prolong insulation life—run your cables in Transite® Ducts.

Current carrying capacities can be increased in a typical duct bank as much as 5%, or I²R losses can be reduced 11%, for cables located in Transite as compared with other ducts used for power circuits.

And, Transite Ducts assure permanent duct banks because Transite is incombustible; is immune to rust and rot; is unaffected by electrolysis; will not slag under action of an arc, and will retain its high original strength.

An unusually smooth bore assures no injury to cable sheath, either in natural movement under load, or when pulling-in cables. Long, lightweight lengths can be quickly and economically installed.



In addition, a full line of fittings simplifies even the most complicated of installations.

For full information on Transite Ducts, write for Data Book DS-410. Johns-Manville, Box 290, New York 16, N. Y.



*Reg. U. S. Pat. Off.

How Transite Ducts increase current carrying capacities

Type cable 3 cdr. 500 MCM Compact Sector, 15 KV
(6th Edition AIEE Spec.)

No. of cables—3 (all loaded in one bank)

Daily Load Factor—75%

Earth Temp. ambient—20 C

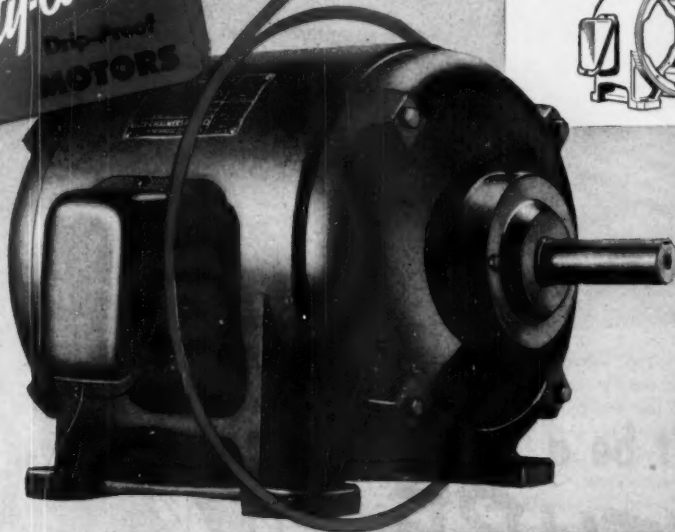
| | Transite | Other |
|--|----------|-------|
| Total Therm. Res. to Dielectric Loss (C watts/ft.) | 5.66 | 6.17 |
| Total Therm. Res. to Copper Loss (C watts/ft.) | 4.44 | 4.95 |
| Temp. Rise from Dielectric Loss (C) | 1.9 | 2.1 |
| Allowable Rise for Copper Loss (C) | 59.1 | 58.9 |
| Allowable Watts per ft. cable | 4.44 | 3.96 |
| Allowable Current—(Amps. per cdr.) | 386. | 365. |
| Allowable Current—(Relative %) | 105.6 | 100. |

Johns-Manville

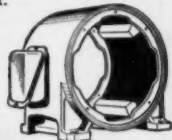
Transite Ducts

"KORDUCT"—for encasement in concrete

"CONDUIT"—for use exposed and underground without encasement



The SAFETY-CIRCLE
The Allis-Chalmers **SAFETY-CIRCLE** is the frame and ends of heavy cast iron that completely surround and protect the working parts of the **SAFETY-CIRCLE** motor.



SAFETY-CIRCLE means

- ★ All-Around Protection ★ Low Maintenance
- ★ Dependable Performance

THE **SAFETY-CIRCLE** MOTOR is protected all around against those four great motor killers — corrosion . . . distortion . . . friction . . . foreign matter. The frame is of cast iron, the most corrosion-resistant material for this purpose.

The strength and stiffness of the cast iron is supplemented by ribbing and bracing to maintain alignment and prevent distortion. Ball bearings are lubricated and sealed at the factory. They require no attention for years. End brackets are drip-proof at no premium.

SAFETY-CIRCLE motors are fully pro-

tected inside, too. Multiple-dipped and multiple-baked stator plus extra inter-phase insulation provide extra protection against electrical breakdown.

With **SAFETY-CIRCLE** protection outside and protected working parts inside, you can count on years of trouble-free, low cost power.

For complete details on **SAFETY-CIRCLE** advantages, see your A-C Authorized Dealer or Sales Office or write for Bulletin 51B6210B. Stocked in sizes 1 to 20 hp. **SAFETY-CIRCLE**, *Texrope* and *Vari-Pitch* are Allis-Chalmers trademarks.

ALLIS-CHALMERS, 930A SO. 70 ST.
MILWAUKEE, WIS.

ALLIS-CHALMERS



Sold . . .
Applied . . .
Serviced . . .

by Allis-Chalmers Authorized Dealers, Certified Service Shops and Sales Offices throughout the country.



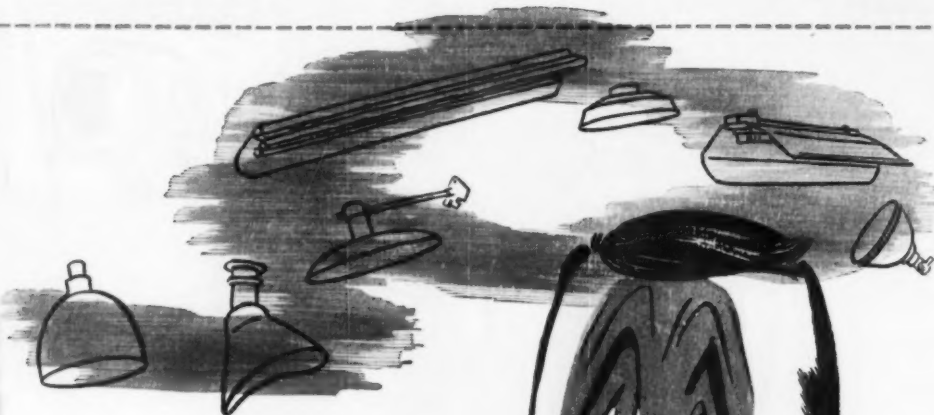
CONTROL — Manual, magnetic and combination starters; push button stations and components for complete control systems.

TEXROPE — Belts in all sizes and sections, standard and *Vari-Pitch* sheaves, speed changers.



PUMPS — Integral motor and coupled types. Sizes and ratings to 2500 GPM.

YOU CAN BE **SURE**.. IF IT'S
Westinghouse



Don't be a
**FIXTURE
PICKER!**



No wonder he's worried. He's picking "fixtures". You know fixtures won't solve lighting problems—but *how many other people do?*

It takes expert planning by qualified engineers to solve lighting problems and give you the Best Buy in Lighting.

Whether you plan lighting, buy lighting, or install lighting, the services of a Westinghouse Lighting Engineer are available to you.

An introduction to one of the many fixtures which Westinghouse offers to meet your demands can be had by writing for Booklet B-4442, Westinghouse Electric Corporation, 511 Wood Street, Box 868, Pittsburgh 30, Pennsylvania. J-04282-A



Westinghouse
**PLANNED
LIGHTING
PAYS**

You pipe the Tune!



PARANITE
INSULATED WIRES
AND CABLES -- will
Give a Great Performance

FOR sixty years Parinite Quality electrical wires, cables, and cords have been manufactured in our Indiana factories. These facilities to serve our trade are strategically located in Jonesboro and Marion, Indiana and are supplemented by warehouse facilities with stock inventories in principal distributing centers. Parinite distributes its many products through wholesale distributors of electrical merchandise.

* PARA — ("CAOUTCHOUC," TO THE NATIVE) MEANS RUBBER

PARACOTE—Means (Quality Controlled) Building Wire

PARAFLEX—Means (Quality Controlled) Non-Metallic Sheathed Cable

PARASYN—Means (Quality Controlled) Type T.W. Thermoplastic Insulated Wire

PARATHERM—Means (Quality Controlled) Type R.H. Heat Resistant Grade Building Wire

PARAUSE—Means (Quality Controlled) Type "RR" Underground Cable (600 Volts)

SPECIFY AND BUY — THESE GREAT NAMES MEAN QUALITY — THEY ARE PARANITE PRODUCTS

IF IT'S **PARANITE** IT'S RIGHT!

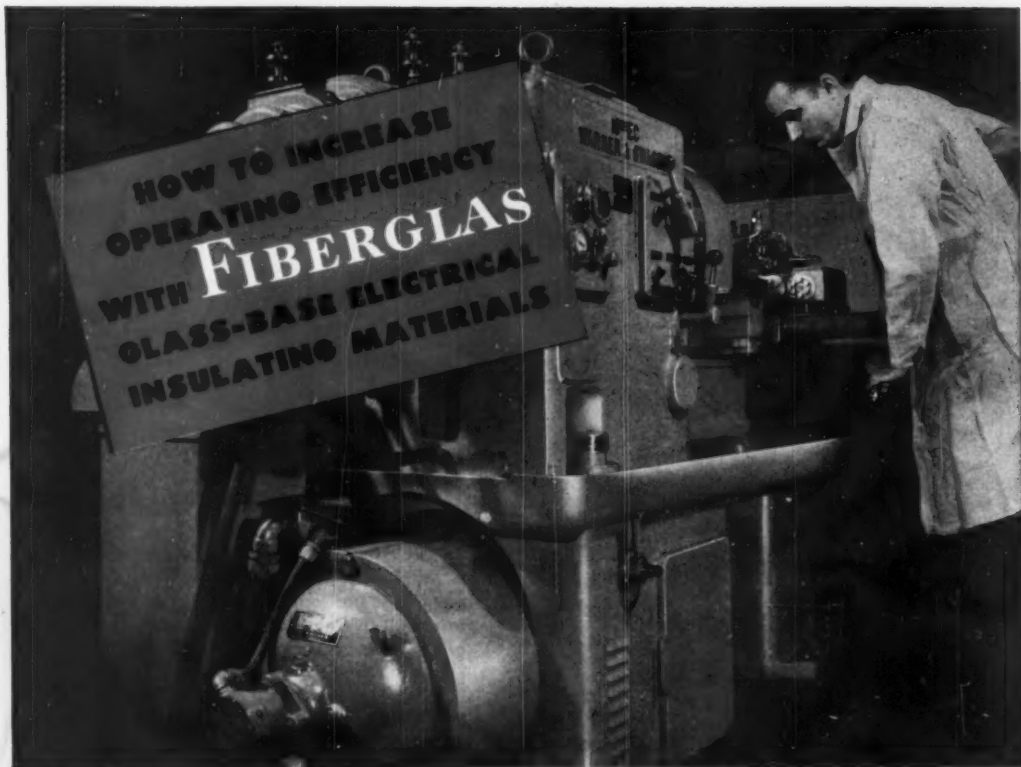
DISTRIBUTED
THROUGH
WHOLESALEERS

PARANITE WIRE AND CABLE
Division of ESSEX WIRE CORPORATION
FORT WAYNE 6, INDIANA

PARANITE

EXPORT SALES OFFICE—LIONEL-ESSEX INTERNATIONAL CORPORATION, 15 E. 26th ST., NEW YORK 10, N.Y.

ELECTRICAL WIRES AND CABLES "BETTER THAN CODE REQUIRES"



FIBERGLAS *Yarns*

HELP INCREASE PRODUCTION! LOWER METAL WORKING COSTS!

"A new approach to machining nonferrous metals!"

That's how Warner & Swasey Company, Cleveland, Ohio, describes its Electro-Cycle turret lathe.

To produce a lathe that would increase production and lower costs, Warner & Swasey uses insulating materials made with Fiberglas* yarns in the main drive motors. The result: under ideal conditions, an increase of 40% in reversal capacity over motors using organic-base

insulations.

In addition, Fiberglas glass-base insulating materials in these motors guard against damaging thermal shocks, wide variations in temperatures of the windings, metal chips, and coolants.

If your electrical equipment must operate under unusual conditions . . . or if you want trouble-free normal operation . . . *specify Fiberglas yarns.*

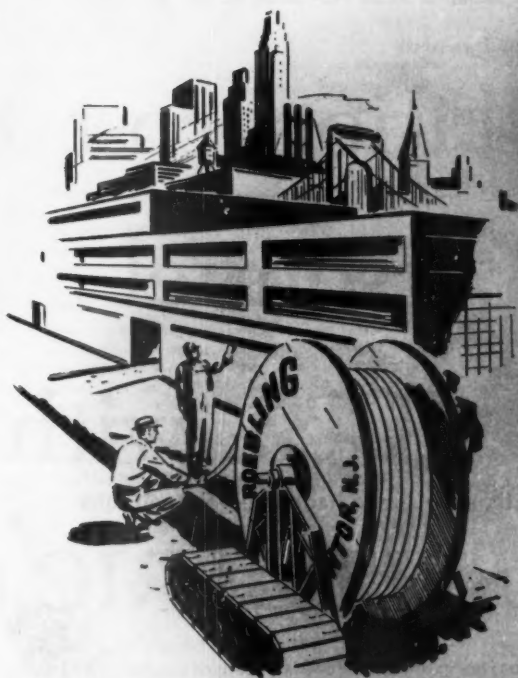
Owens-Corning Fiberglas Corporation, Dept. 856, 16 East 56th Street, New York 22, N. Y.

*Fiberglas is the trade-mark (Reg. U. S. Pat. Off.) of Owens-Corning Fiberglas Corporation for a variety of products made of or with glass fibers.



Yarns

Today it's Roebling!

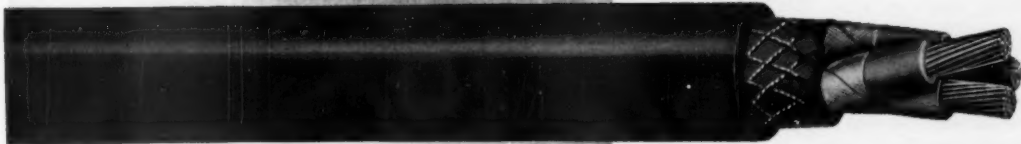


Why men who watch costs specify Roebling ROEPRENE Parkway Cable

THERE'S ONE BIG and deciding reason for choosing Roebling ROEPRENE Parkway Cable . . . it enables you to avoid the expense of underground duct systems! This cable is made for direct underground installation. Only a two- or three-foot trench is needed. And as soon as the cable is out of sight, you can put it out of mind. There'll be no service troubles from wind or weather . . . safe physical protection is assured by the non-metallic armor of a ROEPRENE sheath.

Roebling ROEPRENE Parkway Cable has rapidly become a top choice for series street lighting, parkway boulevard lighting, traffic signal, fire alarm, flood lighting, railroad yard, signal and many other circuits. It is available in single and multiple conductor types—solid or stranded—in a range from 600 to 5,000 volts.

Have your Roebling distributor or Roebling branch office help select the best cable for your special needs. John A. Roebling's Sons Company, Trenton 2, New Jersey.



From copper rod to finished cable all components of Roebling electrical wire and cable are manufactured in Roebling's own plants. painstaking care, research, engineering and modern precision machines are your assurance of highest quality.

ROEBLING

A CENTURY OF CONFIDENCE

Atlanta, 934 Ave. Ave. • Boston, 51 Sleeper St. • Chicago, 5525 W. Roosevelt Road • Cincinnati, 3253 Fredonia Ave. • Cleveland, 701 St. Clair Ave., N. E. • Denver, 4801 Jackson St. • Houston, 6216 Navigation Blvd. • Los Angeles, 216 S. Alameda St. • New York, 19 Rector St. • Philadelphia, 12 S. Twelfth St. • Portland, 1032 N. W. 14th Ave. • San Francisco, 1740 Seventeenth St. • Seattle, 900 First Avenue S.



Macy's

San Francisco



gets

extreme flexibility

to handle load changes and future load growth

low installation cost

everything was shipped complete—as a unit—and easily installed

safety to personnel

no exposed circuits; metal encloses all current-carrying parts

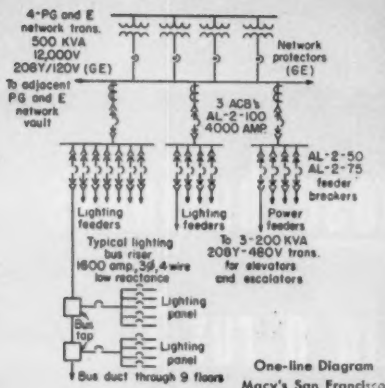
plenty of "IC"....with

100,000 amperes interrupting capacity, adequate to handle all short circuits

GENERAL ELECTRIC

HERE'S WHY . . . "In the department store business we cannot take any chances with power outages or potential fire hazards. We must also plan for expansion. That's why we wanted our power distribution system to be safe, to have adequate feeder and branch-circuit capacity, plus flexibility. General Electric switchgear gave us all these requirements."

E. L. MOLLOY, VICE PRESIDENT
MACY'S, SAN FRANCISCO

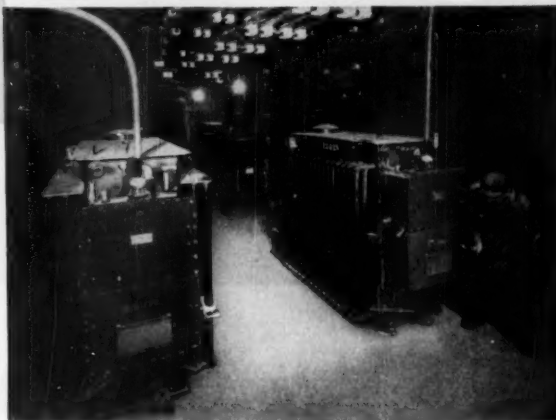


This, the largest switchgear installation to date in any San Francisco commercial building, adequately handles the power requirements that average four watts per square foot (nearly 500,000 square feet). Flexibility of the feeder system permits load changes without increasing the load on the switchgear. The 4000-ampere breakers have induction relay tripping.

Macy's installation is a complete General Electric project—switchgear, three 200-kva transformers for elevators and escalators, power and lighting panels, motors, and control for ventilating and boiler-room auxiliaries. One source of responsibility plus the very best in co-ordinated planning, engineering, manufacturing, and service facilities to give maximum savings and efficiency to the customer. William D. Day, San Francisco, architect; Clyde E. Bentley, San Francisco, consulting engineer.



G-E metal-enclosed switchgear handles the incoming 120/208-volt power. The equipment is divided into three sections, two for lighting, one for power. Breakers (cascaded) are of the drawout type for ease of inspection and maintenance.



Four G-E network units, rated 500 kva, 12,000-120/208 volts in a Pacific Gas and Electric Company vault serve the building. Macy's 2500-kva load represents one of the largest loads added to PG&E's downtown network in recent years.

low-voltage SWITCHGEAR

Modern industrial power distribution systems using G-E switchgear are applicable to any industrial plant or commercial building where you want proper voltage for top performance of equipment, an extremely flexible setup to take care of expanding or changing loads, adequate short circuit protection, safety to personnel, and low installation and maintenance costs.

Be sure to see the "More Power to America" full-color sound slidefilm "Modern Industrial Power Distribution." Ask your G-E sales representative to arrange a showing for your organization.

Investigate today the many advantages of using General Electric switchgear in your plant for efficient, flexible power distribution. Contact your G-E sales representative for further information—and write for the helpful bulletins listed below. Apparatus Department, General Electric Company, Schenectady 5, N. Y.

| | |
|---------------------------------|-----------------------------------|
| GEA-4966 Low-voltage Switchgear | GEA-3083 Metal-clad Switchgear |
| GEA-3642 Air Circuit Breakers | GEA-3592 Load-center Substations |
| GEA-2017 Network Protectors | GEA-3758 Load-center Distribution |

GENERAL ELECTRIC



Whose business is in a rut?

There are people in every business who get bogged down by old ideas and methods. But resistance to new ideas is the exception in the electrical business. Here, new ideas catch on fast.

Take the insulated wire and cable field. Look at the many contractors now using Alcoa Aluminum for feeders and other industrial installations! Progressive contractors are finding—by figuring jobs in aluminum—that it costs less, weighs less, handles easier and faster.

And in large electrical cable installations, the cost comparison is even more favorable to aluminum. Result—good jobs at lower costs, faster installations.

Try this idea . . . figure one good installation both ways—in Alcoa Aluminum and in copper. See the reward for progressive action yourself!


NEW "QUESTION & ANSWER" BOOK

For names of manufacturers and your copy of "Questions & Answers about Insulated Aluminum Conductors" write ALUMINUM COMPANY OF AMERICA, 1785J Gulf Building, Pittsburgh 19, Pennsylvania.



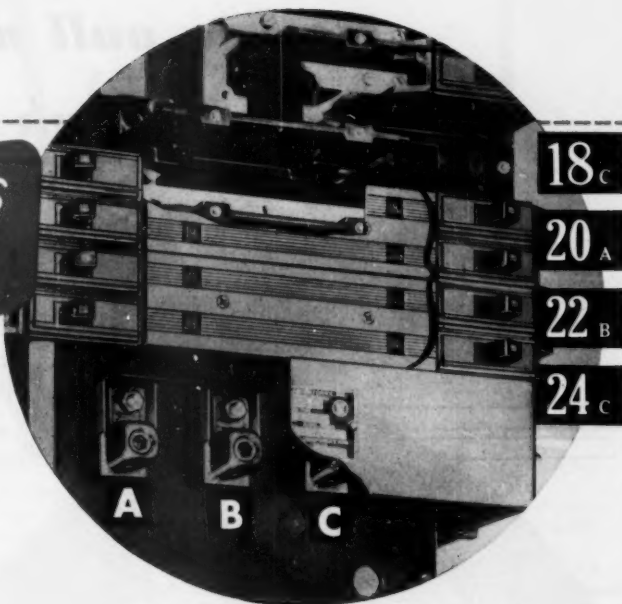
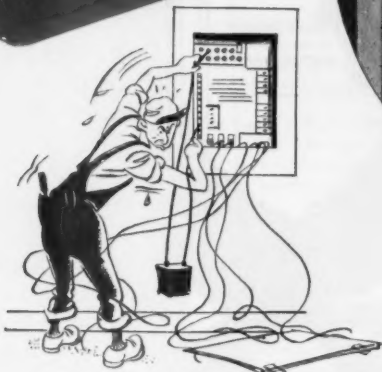
Aluminum Conductors



of **ALCOA**  **ALUMINUM** are made by leading manufacturers

YOU CAN BE **SURE**.. IF IT'S
Westinghouse

**FAST INSTALLATIONS
CUT JOB COSTS**



eliminate panelboard "ring-out" time ... with PHASE IDENTIFICATION

"Ring out" a panelboard can consume a lot of time . . . can cost you a lot of money. That's why Westinghouse 3-phase, 4-wire lighting panelboard design includes permanent pre-phased identification . . . a means of identifying—by letters at each breaker—the sequence of breaker and bus connections. The installer knows at a glance where each breaker is connected.

This feature alone promises a substantial cut in panelboard installation time. But with the Westinghouse lighting panelboard installed costs are reduced even further by . . .

Indicating trim clamps which speed the trim installation.

Quick-fasten access plates which are easily secured or removed by twisting just two wing nuts.

By combining these timesaving features with top-quality construction, Westinghouse gives you a superior panelboard that costs less . . . when *all* the bills are in. So next time be *sure* about savings. Specify Westinghouse!

Descriptive Bulletin 30-930 contains complete information. For your copy, write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-40388



How to pull more watts through old pipes with



Where you must crowd large quantities of wiring into small space. U-S-S Ampyrol small diameter wire requires only about half the space needed for rubber covered wire of equal current carrying capacity.

Where you must increase the capacity of your lines without tearing up the conduit. Old wiring can often be replaced with Ampyrol lines of 50% to 100% greater capacity. The smooth, wax-like surface of Ampyrol makes it easy to pull through conduit.

Where moisture and mildew are a problem. Ampyrol does not absorb moisture —is unaffected by mildew.

U.S.S. Ampyrol

plastic insulated wire saves money—
gives better service!

● U.S.S. Ampyrol is one of those developments that seems too good to be true. Not only is it a money-saver for rewiring jobs, but Ampyrol's unusual properties put it in a class by itself when it comes to *new* and original equipment installations.

About rewiring. Ampyrol pays for itself, a dozen times over, when line capacity must be increased. For capacity can often be doubled, *without tearing up existing conduit*. The savings in rip-out costs *alone* are usually enough to pay for the entire rewiring job.

And it's not difficult to do. Because the smooth, wax-like surface makes Ampyrol easy to snake. Electrical contractors state that they have more trouble removing the old wire than they do installing Ampyrol.

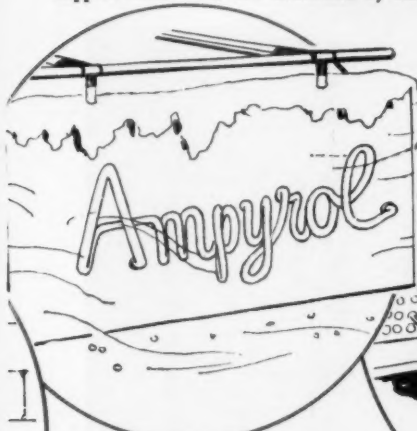
Acids and alkalis don't bother Ampyrol. Neither do ozone and many commercial solvents. Ampyrol does not support combustion. It's unaffected by sunlight, oil and

water. It has excellent aging qualities and *remains flexible without cracking*.

Ampyrol is available in 12 permanent colors that won't wear off. You can use it for some of the most complex coded wiring and be sure your wiring is *permanently* coded.

How is Ampyrol different from other plastic wire? It's all in the way we make it. The American Steel & Wire Company has developed special techniques and machinery that means a better, more uniform product. Write for complete information on types and sizes available.

AMERICAN STEEL & WIRE COMPANY, GENERAL OFFICES: CLEVELAND, OHIO
COLUMBIA STEEL COMPANY, SAN FRANCISCO, PACIFIC COAST DISTRIBUTORS
TENNESSEE COAL, IRON & RAILROAD COMPANY, BIRMINGHAM
SOUTHERN DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK



Where weather or bright sunlight cracks ordinary cable. Ampyrol will give long service. It has excellent aging characteristics and remains flexible without cracking.



Where wiring gets splashed with cutting oils, acids, alkalis, grease and coolants. No damage results for Ampyrol is impervious to all these agents.



Ampyrol Wire and Cable

UNITED STATES STEEL

Meet domestic protection needs

Up to 20 circuits with these 6 Cutler-Hammer Multi-Breakers

SINGLE POLE

The Multi-Breaker for minimum needs. Ask for MO1

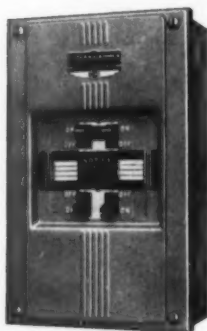


TWO POLES

The Multi-Breaker for small homes. Ask for MO2

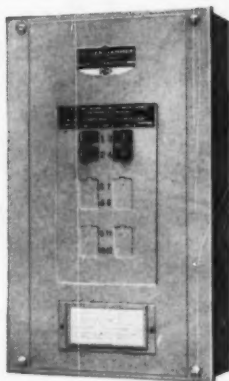
FOUR POLES

In a single block. One and two pole combinations. Ask for MO4



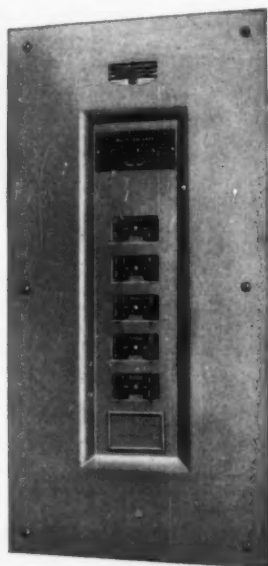
4 POLES BASIC 5-6-7-8 POLES

made by adding single pole units.
Ask for MO8



4 POLES BASIC UP TO 12 POLES

formed by adding four-pole
"plug-in" units. Ask for MO12



4 POLES BASIC UP TO 20 POLES

formed by adding four-pole
"plug-in" units. Ask for MO20

The Cutler-Hammer *simplified* line of Multi-Breakers meets all domestic protection needs—*six items providing from one to 20 circuits!* The fundamental unit is the single pole Breaker. How it combines in multiples up to 20 circuits for small, medium and large homes is shown in the adjoining pictures. Carry a relatively small stock . . . make up the item at the time . . . on the job . . . for the job.

And these Multi-Breakers offer you and the customer every desirable feature—the circuit inter-

rupter that needs only the touch of a little lever to restore service, the "slow—fast" thermal magnetic element that is slow to act on safe overloads but is lightning fast even on low value short circuits (this standard feature is provided at no extra cost), the safe, factory-sealed "works" and handsome appearance which together permit the Multi-Breaker to be installed where it is most convenient. CUTLER-HAMMER, Inc., 1306 St. Paul Avenue, Milwaukee 1, Wisconsin.

Interested in \$500 trifles?



ONE MINUTE LOST is a mere trifle. But lose one minute out of ten while installing fittings — take 10% too long for the job — and you lose \$500 worth of trifles per man per year...Gedney Fittings *stop* such losses, for Gedney's are machined with absolute accuracy and slash your installation time. Order them now.

GEDNEY FITTINGS FIT!



- ★ Accurate malleable iron castings...stop breakage
- ★ Threads are machined to closest tolerances.
- ★ Reinforcing ribs for extra strength...extra grip.
- ★ Smoothed shoulder protects the wire.



GEDNEY
ELECTRIC COMPANY

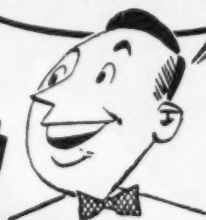


RKO BLDG. • RADIO CITY • NEW YORK 26
Foundry, Factory and Shipping Point: Terryville, Conn.

What did that
SANGAMO TIME
SWITCH cost?



I don't remember...
but it hasn't cost a cent
since we've had it!



WELL WORTH
THE SLIGHTLY
HIGHER PRICE

SANGAMO Heavy-Duty TIME SWITCHES

What makes one time switch a better value than another? Ask the user—he knows. When it comes to time switches their reliability and their performance through the years determines their value.

Users of Sangamo Time Switches enjoy year after year of trouble-free automatic control. The contractor saves the annoyance and cost of service calls due to faulty time switch operation . . . and his reputation for top quality workmanship is protected. The slightly higher price of the Sangamo Time Switch is forgotten while the quality remains.

There's a time switch to meet your exact needs in Sangamo's complete line of high-quality time switches. The Type L, for example, is a heavy-duty versatile unit for continuous service under

widely varying conditions. It can be supplied with a number of control features such as an omitting device, advanced time cut-off, or an astronomic dial for automatic sunset to sunrise operation. All these features are available on the Type W which, in addition, is provided with a complete electrically-wound mainspring and timing mechanism that takes over immediately in case of a power failure and does not have to be reset after current interruptions. The Types L, W, and all other high quality switches of the complete Sangamo line are stocked by your electrical wholesaler.

Write for Sangamo's 16 page Time Switch Catalog No. 1010A. It tells everything you should know to help you choose the best possible time switch for your next installation.



SANGAMO

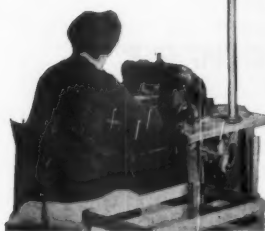
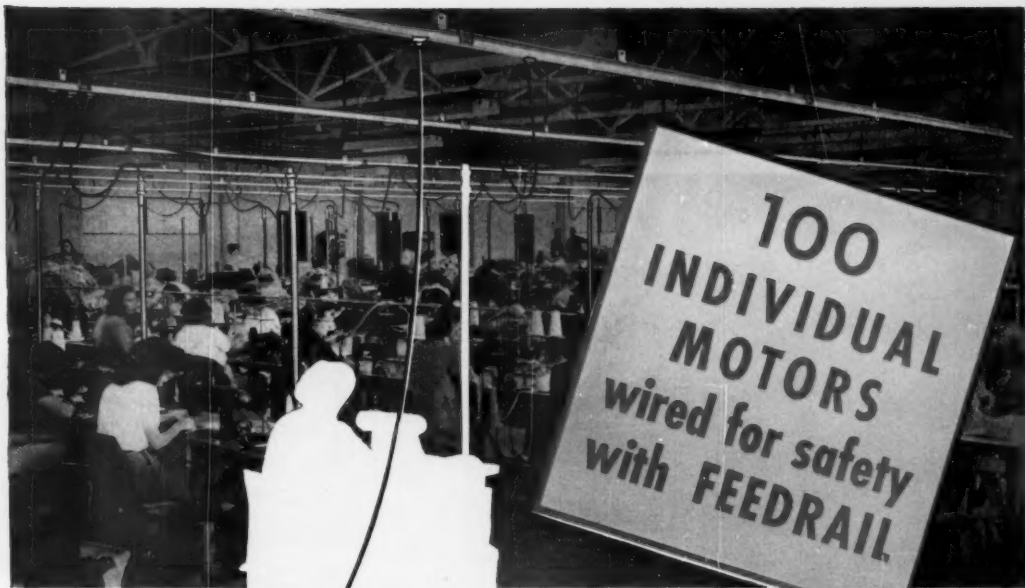
ELECTRIC COMPANY
SPRINGFIELD, ILLINOIS

Have You Tried the SANGAMO Type S?

Here's precision in miniature! An economical, compact, unusually attractive time switch for simple time control problems.



6730-12



**OPERATORS
RELOCATED
*any time!***

A simple count of the number of outlets planned for a room will tell you whether Feedrail would save time and money in the long run. A dozen motorized bench tools will justify a Feedrail line. A group of sewing machines that are frequently re-located makes Feedrail layout a practical necessity. And, if you have moving test lines, lights or motors or cranes and hoists, Feedrail becomes a must.

The reasons are simple. Feedrail is a totally enclosed, overhead distribution system with removable trolleys. Each electrical device may be fused, or protected by circuit breakers. No wires on the floor—Everlok connectors can't pull out accidentally—and maintenance and interruptions to production are practically eliminated.

Contractors

everywhere are suggesting Feedrail layouts because one application spreads quickly to the entire plant. For prestige and profit ask the Feedrail representative to design a layout for your next important wiring jobs.

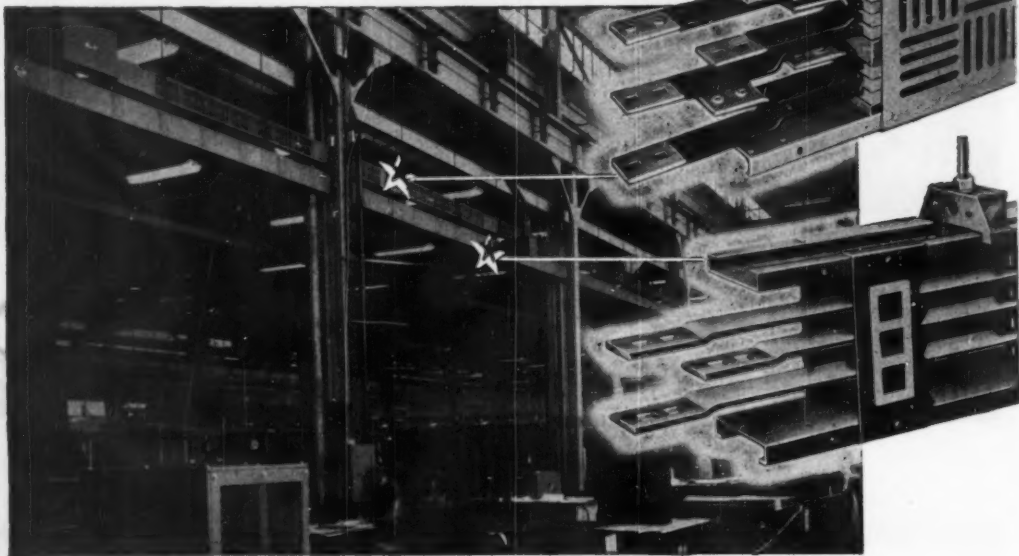
**ELECTRIC
FEEDRAIL**

FEEDRAIL CORPORATION

Subsidiary of Russell & Stoll Company, Inc.

125 BARCLAY STREET • NEW YORK 7, N. Y.

YOU CAN BE **SURE**.. IF IT'S
Westinghouse



BUS DUCT-first for **full secondary power**

Much more carrying capacity can be packed into a smaller space with Bus Duct than with conduit and wire. It's not only compact and neat appearing but more flexible, too.

You need only to bolt each prefabricated section together. Operations can be expanded at any time without expensive rewiring... and with minimum time and labor costs. Power supply is always convenient to machines. Plug-in openings every 12 inches on alternate sides eliminate long cable runs. Installations can be made either horizontally or vertically.

Note the application above. Low Impedance Duct is used for long feeder lines where mini-

mum voltage drop is important... Plug-in Duct is used for an area having a scattered load. Together, they represent an unbeatable combination, first for full secondary power.

Experienced Westinghouse Field Engineers are available to help you plan your secondary power distribution system. For full particulars, phone your nearby Westinghouse Representative or write for Bus Duct Booklet B-4271, Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania.

J-30030



Westinghouse

BUS DUCT





On more and more
spec sheets . . .

Delco preferred!

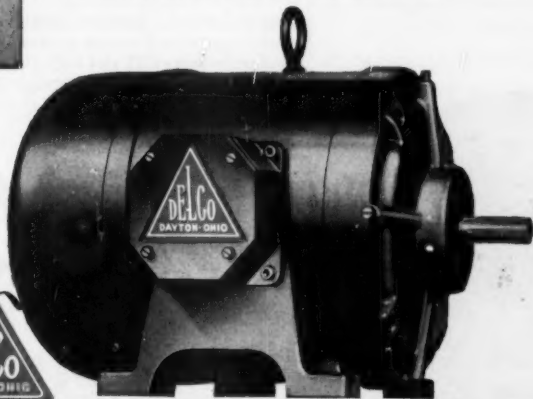
- Positioned Bearings
- Delcote Coil Insulation
- Corrosive-Resistant Cast Iron Frame
- Positive Lubrication
- Dynamically Balanced Rotor and Shaft Assembly
- Water-Tight Conduit Box

Two words that mean top motor performance

You see the words "DELCO PREFERRED" on more and more spec sheets. That's because Delco motors are built the way production men want motors built. They are rugged, dependable, and made of the finest materials. A few of the performance extras that Delco motors give you are listed here:



Get complete data on Delco motors. Call or write Delco Products, Dayton, Ohio . . . or get in touch with the nearest sales office listed below.



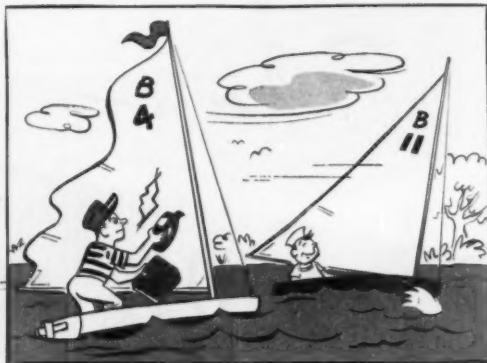
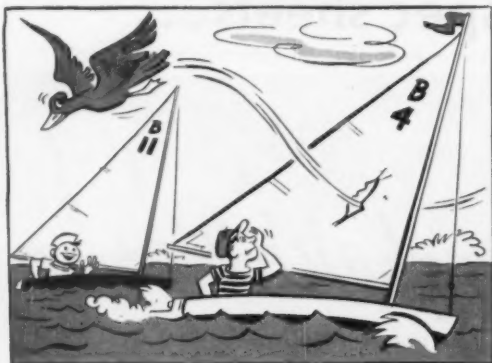
DELCO MOTORS

DELCO PRODUCTS, DIVISION OF GENERAL MOTORS CORPORATION, DAYTON, OHIO

SALES OFFICES: CHICAGO • CINCINNATI • CLEVELAND • DALLAS • DETROIT • HARTFORD • PHILADELPHIA • ST. LOUIS

ELECTRICAL CONSTRUCTION AND MAINTENANCE . . . SEPTEMBER, 1950

You can do a lot



with a little

GOLD SEAL TAPE



For the lasting "tack" that means a fast, sure job, electricians agree that you can't beat Gold Seal Tape.

It goes further—because there's no waste. Guaranteed footage assures full measure in every roll, and high dielectric strength means less footage is needed per job. No pinholes—one

thickness insulates. Tears evenly, does not ravel,—and it won't dry out or peel.

Try it. Buy the single rolls, or the convenient 10-roll container... every roll cellophane-wrapped to keep it factory fresh. Jenkins Bros. (Rubber Div.), 100 Park Ave., New York 17.



JENKINS

*Gold Seal
Tapes*



FRICION and RUBBER TAPES

Jenkins Bros. also make Diamond Seal Friction and Rubber Tapes which meet both ASTM and Federal Specifications.

MADE BY JENKINS BROS. ... MANUFACTURED BY JENKINS BROS. ...

BIDDLE

Instrument News

- ELECTRICAL TESTING INSTRUMENTS
- SPEED MEASURING INSTRUMENTS
- LABORATORY & SCIENTIFIC EQUIPMENT

NUMBER 4 OF A SERIES

JAMES G. BIDDLE CO., 1316 ARCH ST., PHILADELPHIA 7, PA.

NEW CVM TYPE MEGGER® GROUND TESTER

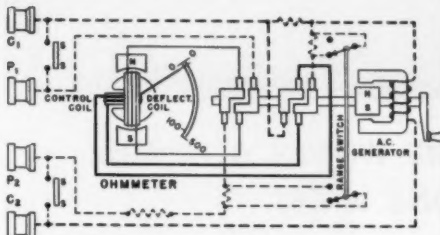
... Provides Simple, Single Test Method for
Measuring Resistance of Earth to Ground Connections

This modern design, strong, compact ground tester weighs only 6 pounds, measures $7\frac{1}{2}'' \times 5'' \times 5\frac{3}{4}''$. An ideal, easy-to-use field instrument for determining if the resistance to earth of man-made grounds is sufficiently low to minimize dangers due to lightning.



For complete details and prices on this New instrument, write for Bulletin 25-80-ECM.

It is a completely self-contained test set with its own generator for supplying test current—no dependence on batteries or other current supply.



THERE'S ECONOMY IN THE FLEXIBILITY OF THIS INSTRUMENT...

Dual-Operated Meg Type Megger® Insulation Tester

Serves for field tests where no current is available or for repetitive or time tests by plugging into 115 v. 60 cycles.

Operate by hand or plug in the rectifier—it's always ready for service—either way.

The rectifier offers advantages for such applications as:

1. Production testing of all types of electrical equipment and components.
2. Testing multi-conductor communication cables, as in telephone plants.
3. Testing multi-conductor control circuits in power plants.
4. Acceptance tests, such as from load centers, in lighting and power installations.
5. Testing multi-conductor control and power circuits at central locations in railway signal installations.
6. Testing generators, cables and other equipment by the time-resistance method, where the dielectric absorption or leakage current of the insulation under test is high enough to bring the resistance measurement within the range of these models.
7. Experimental and laboratory use.

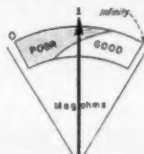
Write for Bulletin 21-46-ECM.

GETTING THE MOST FROM

INSULATION RESISTANCE MEASUREMENTS

Interpreting Results When Time and Test Voltage are Changed

Electrical men agree that the accepted method of determining whether insulation is healthy is by measuring its resistance. Megger Insulation Testers have long been the popular choice of men charged with the responsibility of electrical maintenance. These men recognize the importance of the proper analysis of the readings they obtain with their Megger instruments. The best think-



ONE MEGOHM per 1000 v is still a good practical guide

ing of men who know is available in Biddle literature on the subject. For our latest publication on electrical insulation resistance, "For Practical Men," just write to us at the address above and we will mail it at no obligation. Many who have already read this helpful booklet are requesting additional copies for their departments. Ask for Bulletin 21P8-ECM.

Is Your LITERATURE FILE Up to Date?

The bulletins offered here will be mailed at no obligation. Just check this handy form and have it mailed with your name and address.

- ☐ 25-80-ECM ☐ 21-P8-ECM ☐ 21-46-ECM
☐ Complete list of latest Bulletins.

We are constantly publishing new technical bulletins on Biddle Instruments. A complete list of our latest bulletins will be mailed you on request, so that you may check it to bring your files up to date.

James G. Biddle Company
1316 Arch Street, Philadelphia 7, Pa.



GEORGE PAUL, Architect

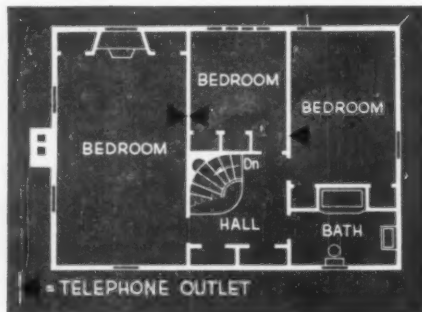
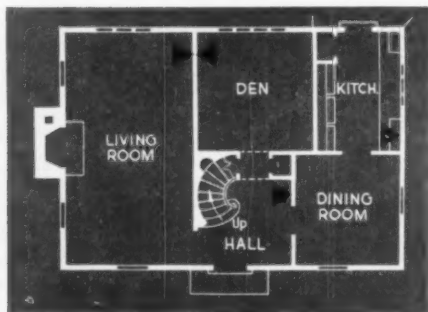
PLAN A HOME WITHIN A HOME— FOR TELEPHONE WIRES

Give telephone wires a place of their own and they'll never interfere with attractive walls and woodwork. Built-in raceways conceal telephone wires, provide for telephone outlets at the right places. And when included in the electrical contract, they mean extra profits for you.

Simple wiring channels can be installed easily

while a home is under construction. A few lengths of pipe or tubing, placed inside the walls, will carry telephone wires to planned outlets. The slight additional cost is more than offset by customer satisfaction.

Remember—NO ELECTRICAL CONTRACT IS COMPLETE UNLESS IT CONTAINS RACEWAYS FOR TELEPHONE WIRES



BELL TELEPHONE SYSTEM

ALLIS-CHALMERS
Dry-Type
Transformers

Lift Lazy Voltages!



BELOW-NORMAL VOLTAGES cost money! At 90% normal voltage, you get only 70% of the light you pay for — only 80% of the motor torque — only 81% output from heating operations.

You can correct these low voltages by spotting Allis-Chalmers dry-type transformers at load centers. They shorten secondary runs, thereby reducing copper loss and improving lighting, motor and thermal efficiency. They let you *use* all of the power you buy!

They're easy to mount, too. Allis-Chalmers "dry-types" can be located on walls, platforms, posts, or directly on machines. No fireproof vaults needed.

Transformers are stocked country-wide in popular ratings. For information and bulletin 61B6382A contact your nearby Allis-Chalmers Dealer or Sales Office.

A-3026

**ALLIS-CHALMERS, 930A SO. 70 ST.
MILWAUKEE, WIS.**

Built For L-O-N-G Service

FAST COOLING ADDS WORK YEARS

Natural chimney draft action draws cooling air through base, up through vertical ducts in windings, and out through cover overhang. Class B insulation used throughout. Coils impregnated to make them impervious to moisture and protect against dirt.

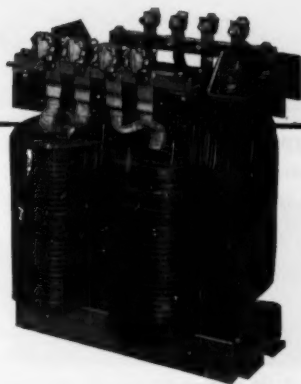
STURDY SIDE FRAMES CLAMP UNIT

Fabricated clamping members preserve the alignment and rigidity of core and coil structure before installation and under all conditions of operation. Notched plates engage end rails to guide core and

coil into case. Case is *Spra-Bonderized*, triple-coated with baked-on paint.

TIME-SAVING SOLDERLESS CONNECTORS

Simple, clamp type connectors are a standard feature on 15 through 50 kva, single phase, and 37½ through 100 kva, three phase units. On larger sizes, flat drilled bars are arranged vertically for any connector. Lower ratings equipped with both front and bottom drop out plates that let you make connections from side instead of from below. Roomy wiring compartments with conduit knockouts speed hook-up time on all sizes.



ALLIS-CHALMERS

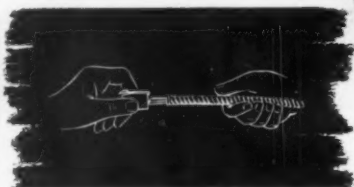
ELECTRICAL CONSTRUCTION AND MAINTENANCE . . . SEPTEMBER, 1950

*It's New!
It's Different!
It's Easier to use!*

SnapX



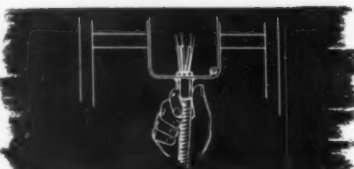
PAT. APPLD. FOR



INSERT cable in **SNAPX** connector.



COMPRESS spring clip that holds cable.

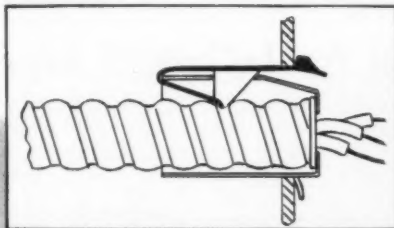


SNAP IN to box knockout and the cable is set — the job done!

The Entirely New Connectors For Armored and Non-Metallic Cable That You Just Snap Into Place!

SNAPX is the new cable connector that is installed without tools. There are no nuts or screws to tighten. Just compress, snap it in place and it's set.

To try it is to buy it. See how easy SNAPX is to use! Write today for your free sample, giving the name and address of your electrical wholesaler.



SnapX Fittings for 2-12 and 3-12, 2-14 and 3-14 armored, and 3-12 and 3-14 non-metallic cable carry the underwriters seal of approval.

BRIEGEL

METHOD
TOOL
CO.

GALVA. • ILLINOIS



Crowell-Collier Building, New York, N.Y.
Architect: Leonard Schultze Associates, New York, N.Y.
Fixture Manufacturer: Miller Company, Meriden, Conn.
Electrical Contractor: L. K. Comstock, New York, N.Y.
Glass: CORNING ALBA-LITE in 2,600 Reflector Sections



Corning ALBA-LITE for Crowell-Collier Building!

*Affords efficient control of fluorescent lighting,
accentuates color quality*

High efficiency in lighting glassware is always important. It can mean fewer fixtures, better foot-candle values, a more harmonious environment in which to work. It was for these reasons that Corning ALBA-LITE was specified for the Crowell-Collier Building.

ALBA-LITE diffusely transmits 60 to 65% of the light and diffusely reflects 25 to 35%, making its efficiency greater than 90%. Yet its diffusing qualities assure maximum obscurity of light source and minimum panel brightness. In the new Crowell-Collier Building offices illustrated above, 45-50 foot candles of illumination are

maintained. The even light transmission and negligible color distortion contribute to harmonious decoration.

High efficiency is only one advantage of ALBA-LITE. It can be bent as required, affording unlimited design flexibility. Widths vary from 2" to 24", lengths from 8" to 100". ALBA-LITE will not warp, discolor, scratch or attract dust. The smooth surface of ALBA-LITE makes cleaning easy.

Bulletin LS-17 gives you complete details on Corning ALBA-LITE and illustrates many ways it is being used. It is yours for the asking. Sign and return coupon below today for your copy.



CORNING GLASS WORKS CORNING, NEW YORK

Corning means research in Glass

FOR EFFICIENT, ATTRACTIVE LIGHTING...

CORNING ALBA-LITE for diffusion of fluorescent light... CORNING FOTA-LITE for high level illumination... CORNING brand LENS PANELS and PYREX brand LENS LITES for prismatic light control

CORNING GLASS WORKS Dept. EC-9, Corning, N. Y.

Please send me a free copy of your bulletin LS-17 describing CORNING ALBA-LITE.

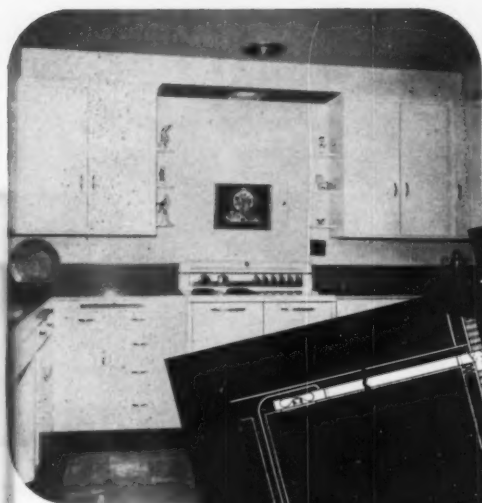
Name Title

Firm

Address

City Zone State

Inside wall →
or ceiling ←...



It's all the same to **Blo-Fan***

COMBINATION FAN AND BLOWER

The versatile Blo-Fan is designed for installation in the most convenient, efficient spot above the point of air pollution... It can be installed in an inside wall without sacrificing valuable cabinet space... However, ceiling installation is recommended because the Blo-Fan is well above head height where it captures ALL the odors, steam, grease and smoke... Blo-Fan requires only 3½ inches above or behind the plaster where it fits between standard joists or studs... Ducts are run thru roof or outside wall... And remember this, only Blo-Fan has the patented blade which combines the power of a blower with the volume of a fan... Only Blo-Fan has the nine-position control switch which permits operation at the exact speed required by the degree of air pollution.

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PRYNE & CO., INC., Box E-9, Pomona, California

Manufacturers of Pry-Lites—the modern recessed lighting fixtures with snap-on fronts.

*Trade Mark Reg.

Blo-Fan
OFFERS 4 OPPORTUNITIES
FOR INCREASED PROFIT

Home owners know that Blo-Fan ventilation keeps homes clean—cuts re-decorating costs.

Put them where they're needed!



KITCHEN



BATH



GAME ROOM



LAUNDRY

Cash in on owner demand with Blo-Fan Spot Ventilation at the Point of Air Pollution



**Yours Free
for
Better
Business!**

SYLVANIA'S NEW LIGHTING FILE for Contractors

A complete guide to lighting in 10 parts!

IT'S NEAT, IT'S COMPLETE, IT'S NIFTY, IT'S NEW, and it's designed to help you get more lighting business, right now!

SYLVANIA CONTRACTOR'S LIGHTING FILE gives you all the information you need, in one handy file . . . concentrates all the facts and figures, prices and specifications, where you can find them in a flash.

YOU'LL USE THIS FILE DAILY, for figuring lighting plans, for estimating, for calculating bids, and for real help in competitive selling!

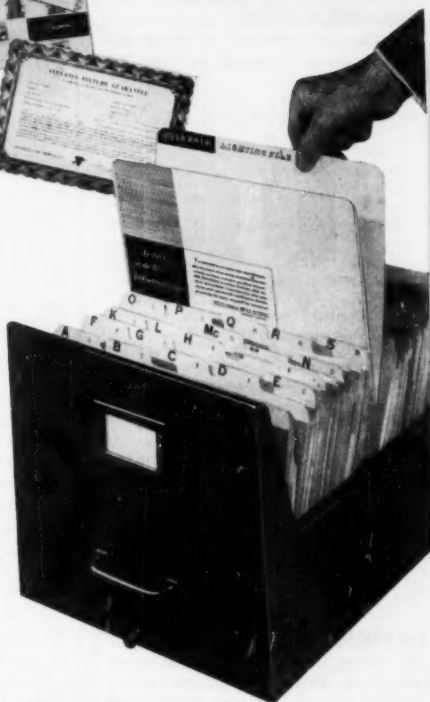
YOUR DISTRIBUTOR HAS YOUR COPY—Call him for it today, or mail the coupon below.

Here's what it contains:

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Booklet on Store Lighting
Booklet on School Lighting
Booklet on Office Lighting
Booklet on Plant Lighting

Catalogue of Sylvania Fixtures
Flexi-Module Ceiling Folder
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SYLVANIA ELECTRIC

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Please send me a copy of the Sylvania Contractor's
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**SOME
DEPENDABLE
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— EASY TO INSTALL



FLUSH TUMBLER SWITCHES. Small base, of Bakelite. Easy and quick to install. Extremely sturdy. Designed for type "C" lamp loads.



SPHINX SWITCHES. Silent, mercury break. Durable, modern, dependable. Designed to fit standard switch boxes.

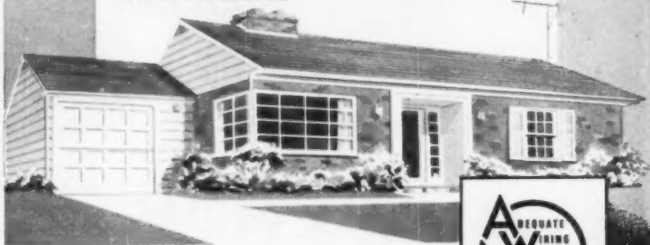


FAN HANGER. Supports the fan, conceals the wiring. Provides positive electrical connection. Easy to install and fits a standard 4" square box with plaster cover.



OUTDOOR RECEPTACLES. For installations exposed to weather — or indoor installations exposed to excess humidity. Complete line available.

How you benefit by a **QUALITY Wiring Job**



with **ARROW** WIRING DEVICES

There's no good reason for poor quality wiring or inadequate wiring devices. The cost is only a few dollars extra — not enough to justify a botched job.

And there are plenty of good reasons for doing a good job — an adequate wiring job with plenty of conveniences, and with wiring devices to meet your customer's maximum needs. Good wiring is good for your reputation, saves you time and money in the end. A happy homeowner, discovering the treasures of "wiring luxury" for the first time, will be your best advertisement. You won't be called back to put a light on the cellarway, an extra outlet in the kitchen. Instead, customer satisfaction will build your business, get you more and better business. So do it right — first time. And choose your quality wiring devices from our broad line of modern, dependable, service-proved units.

Through messages like these, we're reminding architects of the importance of adequate wiring, and quality wiring devices, to everyone in the building field. Good Housekeeping Booklet "Electrical Planning In The Home" sent on request.

Branches in: Boston, Chicago, Dallas, Denver, Detroit, Los Angeles, New York, Philadelphia, San Francisco, Syracuse.

In Canada: Arrow-Hart & Hegeman (Canada) Ltd., Mt. Dennis, Toronto.



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ELECTRICAL DISTRIBUTOR
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For more information, write today to:
1709 Laurel Street,
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**WIRING
DEVICES**

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ELECTRIC DIVISION

**ENCLOSED
SWITCHES**

**THE ARROW-HART & HEGEMAN ELECTRIC COMPANY
HARTFORD, CONNECTICUT**

SEPTEMBER . . . at a Glance

Washington Outlook

Confusion in Washington mobilization planning, irksome as it is to business men, is aggravating but normal. The ponderous checks and balances of a democracy do not allow individuals, however competent, to forge ahead on needed action.

So don't look for dramatic action on controls. They will come, but gradually.

Eastern Editor Berlon Cooper, rounds up the Washington scene from the viewpoint of our industry in a news piece on page 191. From his years with the WPB and other Washington agencies he is especially well qualified to appraise current activities there and interpret them for us.

Code Editor

Because this page was omitted last month to make way for a lengthy editorial, a new name appeared over "Questions on the Code" without introduction. B. A. "Bernie" McDonald, Chief Electrical Inspector in Rochester for the New York Board of Fire Underwriters, hardly needs one, anyway. He has been riding herd on problems of Code interpretation in upstate New York for some 30 years.

He is prominently active in Eastern Section IAEI affairs. Like the other members of our panel of expert consultants, Squires and Rowell, he brings to this department not only a thorough understanding of the Code but the practical viewpoint of a working inspector in daily contact with problems of Code application and interpretation. His contributions to "Questions on the Code" will supplement those of our other consultants and make possible a substantial expansion of this extremely popular department.

Relocation

Moving a plant across the country involves adapting a lot of electrical equipment to new power distribution facilities. Louis Pente of Chance Vought Aircraft tells us some of the problems and methods encountered on such a move in his article "Electrical Problems of Plant Relocation" on page 45.

Relighting

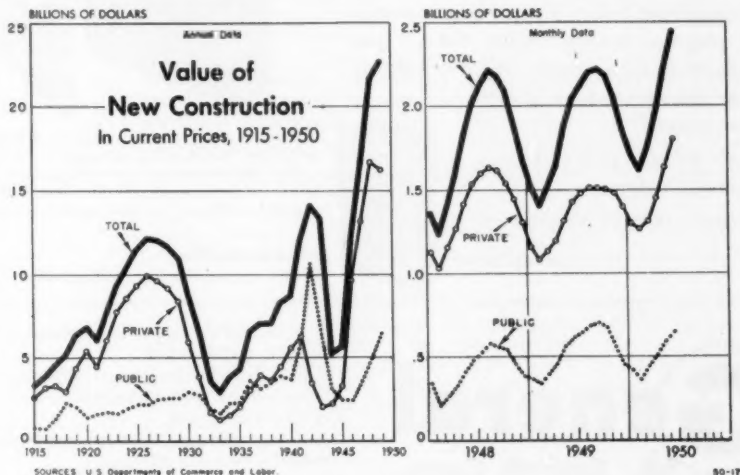
A lot of traditional architecture provides sturdy and dignified housing. But the advance of modern

lighting pays little heed to tradition. The lighting engineer has to meet the problem of pouring adequate lighting into areas that were conceived in an era that could not foresee modern illumination standards. And he has to do it with little disturbance to the traditional architectural features of the building. A good example is described in "Bank Modernization Features Relighting" on page 62.

Modernization

An interesting viewpoint on wiring modernization comes up in George Young's story about the Los Angeles, Union Bank and Trust Co. building job, page 56. Much of the work represents improvements which are not visible to the public but which literally give the building a new lease on life electrically.

The entire downtown business district of Los Angeles is in for electrical rejuvenation if the Downtown Business Men's Association has its way. They are pressing for modernization to combat obsolescence in properties which make up the business district and ultimately decide the business health of the area.



Completely Re-Engineered FRONT OPERATED TOGGLE

Service Entrance Equipment



SNAP-ACTION;
TOGGLE ACTUATED

CAN BE SEALED WITH
PADLOCK IN EITHER
ON OR OFF POSITION

UNDERWRITERS' LABORATORIES
APPROVED

SEALED DOOR

PACKED IN
INDIVIDUAL CARTONS

SEALED TRIM

HINGED TRIM AND SINGLE
FASTENING SCREW
ON SURFACE TYPE

ATTRACTIVE GRAY
BAKED ENAMEL FINISH

Cat. No. 63324

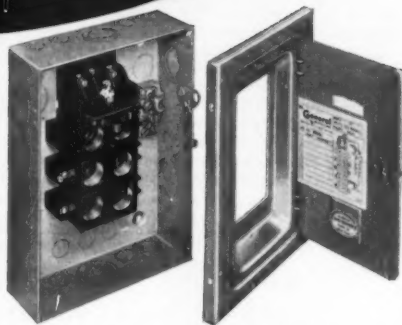
General's new Front Operated Toggle Service Entrance Equipment has been completely redesigned to incorporate the very latest engineering features.

The unit shown above is Cat. No. 63324 which is a 30 amp. 3 wire, 2 main fuse front operated toggle switch controlling four plug fuse branch circuits. Other types of 30 amp. combinations are available—fused or unfused mains—2 or 3 wire service—up to six branch circuits—flush or surface.

For further details see page 20, Cat. 4809-A—write for your copy today.

Available exclusively through wholesalers.

Cat. No. 633NP



Solderless pressure wire connectors or line side • Dependable full-floating contacts • All bakelite unit • Will accommodate non-tamperable fuses • Insulated neutral (bonding screw furnished for grounding) • Ample wiring room and abundant knockouts.

Also available—

Front operated toggle, plug fused safety switches

General
Switch Corp.

49 Roebling Street Brooklyn 11, N. Y.

One of the largest Manufacturers of:

SERVICE EQUIPMENT . . .

Pullout, Front Operated Toggle and Side Operated types.
Indoor—surface or flush, and Outdoor.

SAFETY SWITCHES . . .

30 through 1200 Amp., 250 V and 600 V Type A, C and D.
Indoor and outdoor, HP rated.

ELECTRICAL DISTRIBUTION EQUIPMENT

SALES OFFICES IN EVERY MAJOR CITY

Rising Prices

THE PRESENT ECONOMIC complications of the contractor is a unique phenomenon. Where he was negotiating extra fives he is now paying a premium. What he thought were firm quotations, were suddenly recalled. Normal delivery schedules turned into virtual rationing almost overnight. A rush of buyers appeared suddenly in a market capable of producing and offering an unprecedented volume of materials of all kinds. The result is higher prices.

ACTUAL PURCHASES by contractors during the July-August period, however, break down into four categories.

1. Normal buying for current needs which ought to have been about 20 percent over the same period in 1949 on the basis of contract awards of this year.
2. Buying to cover outstanding commitments, work contracted for but unfinished. This involves no unusual load since it consists of orders for future delivery which would be forthcoming in normal trade anyway.
3. Buying to build inventory for advantage on future work.
4. Buying for speculation to catch a potential general price rise.

WHEN THE DUST SETTLES we may find that stockpiling and speculation are actually minor factors in the current market situation. A sudden covering of outstanding commitments at any time involves a staggering volume of orders. And this year the amount of normal construction work contracted for but unfinished was at an all time high in June.

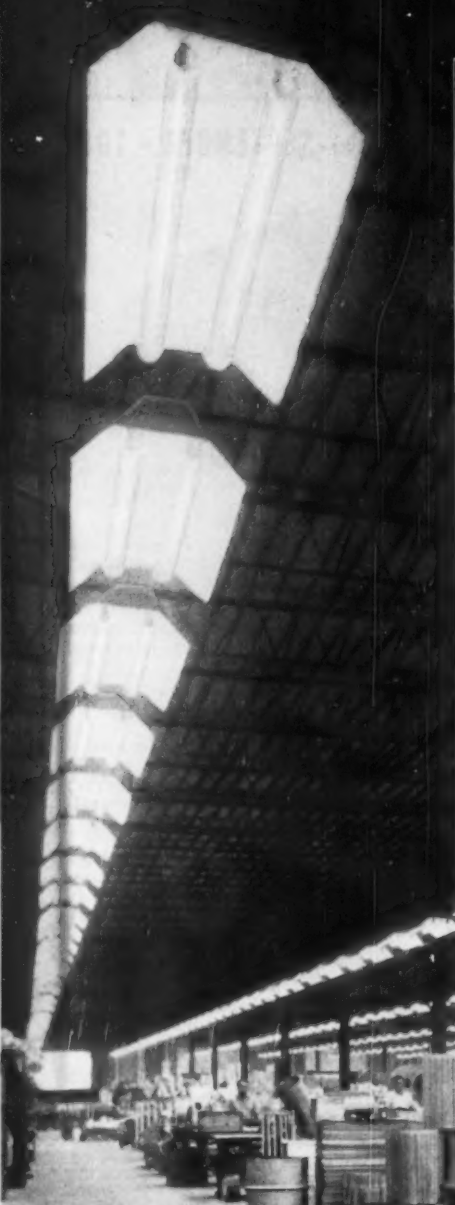
EXTENDED INVENTORIES and speculative buying is relatively rare in electrical contracting. They involve expensive overhead, warehousing and tying up working capital. The chances are that contractors' inventories are actually much less than optimum for the kind of market and responsibilities that lie ahead.

PRICES COULD FLATTEN OUT as the first impact of the Korean crisis fades into the background. Predictions on the basis of declared military needs do not at this time show that a cut-back in production of normal electrical materials is pending. We can have no assurance, however, that mobilization can move forward at the moderate pace of present plans.

WITH REASON AND RESTRAINT along the distribution line prices can be held to moderate levels. There is no reason for panic buying. There is no reason for hold-up prices. A firm insistence on the brand and catalog number named on the order plus a willingness to wait till you get what you want will break the back of any plans to unload less desirable goods at plush prices.

CURRENT PRICE MOVES are a clear warning against continuing the kind of volume-without-margin sharpshooting that has plagued the industry for months. Contracts of extended duration today are dangerous. They should contain adequate compensation for the risk involved as well as escalator and escape clauses. A vigorous and prosperous electrical construction industry is a valuable asset in peace; a vital asset in war. Let's keep it that way.

William T. Stuart



You know the LIGHT is RIGHT

...when it's "via Graybar"

For plant, for office, for product—when you order lighting via Graybar, you know the light will be the right kind, the right intensity, and applied right. We have planned and supplied lighting systems of every type. A Graybar Lighting Specialist can be of important help to you and your customers in planning any lighting system, indoor or out. In addition, with just one order to Graybar, you can also obtain all the necessary conduit, wiring, and supplies.

Fast delivery of lamps

Graybar distributes every type and size of lamp required to light any plant. They're all G-E, so you get the best in quality and long service. To assure prompt deliveries, Graybar maintains lamp stocks at more than 100 warehouse locations throughout the nation.

Expert help on lighting

Graybar Lighting Specialists are qualified to help you with expert advice on fluorescent, filament, or mercury lamps and lighting units for any application. Because Graybar has the most complete selection of lamps and lighting units available from any one source, these men can impartially recommend the lighting equipment that's correct for any of your customer's illumination needs.

Call Graybar for Everything Electrical

Graybar distributes more than 100,000 electrical products of over 200 manufacturers—carefully selected materials, equipment, and tools for wiring, lighting, communication, power. To aid fast delivery, thousands of these items are delivered from local stocks at more than 100 Graybar branch locations. This nationwide network of warehouses may be a real time-saver when you're looking for hard-to-find items. Graybar Specialists in various fields are on call to help you meet unusual problems. Graybar Electric Company, Inc., Executive offices: Graybar Building, New York 17, N. Y. 3086

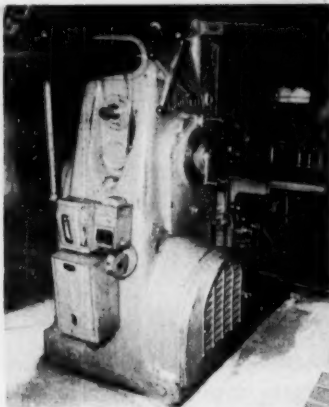
IN OVER 100 PRINCIPAL CITIES



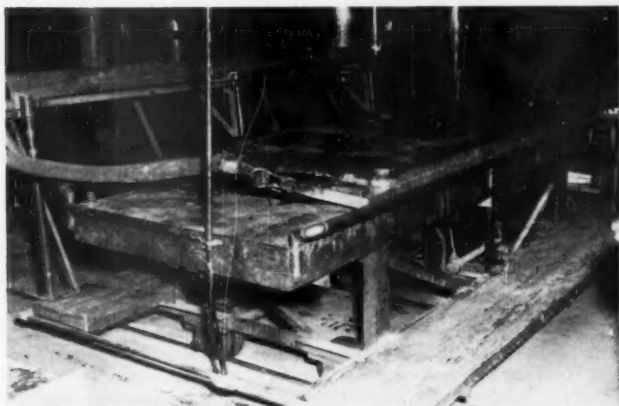
You get the best of
everything electrical
Via Graybar



BUS DUCT DISTRIBUTION system at the Texas plant was waiting for quick connection of motors rewound and reconnected for 480-volt operation. This is a structural test area.



CONTROL CIRCUIT TRANSFORMERS were installed to convert machine tool motor starters and a 110-volt outlet.



A 45-KW. PLATEN used with a 5,000-ton hydropress operates on 230 volts through transformer.



DRY TYPE TRANSFORMERS step down the 480-volt distribution to 230-volt.

Electrical Problems of Plant Relocation

How electrical equipment was adapted to a higher voltage distribution system when Chance Vought Aircraft moved from Connecticut to Texas.

By Louis Pente

Assistant Plant Engineer, Chance Vought Aircraft, Dallas, Texas

THE move of Chance Vought Aircraft from the East coast to a large, modern Naval industrial reserve plant in the Southwest last year involved an unprecedented mass conversion of machine tools and electrical equipment. Of the 28 million pounds of equipment shipped by train, plane and water from Connecticut to Texas during this move, the majority was electrically controlled machine tools wired for 220-volt operation. The new



ELECTRIC OVEN control panel has small transformer to supply the control circuit and temperature control instruments, as well as a new fused safety switch.



LABORATORY POWER SUBSTATION has dry type transformer to supply 220-volt, 3-phase distribution for special equipment that could not be reconnected.

plant in Texas had a 480-volt distribution system.

The company had never anticipated that one day all of this material would be lifted bodily and moved halfway across the continent to a plant wired for a different voltage. Hence, there were no electrical data included in the plant's inventory records to help the electrical maintenance department determine, in its advance planning, the scope of the conversion job.

The first pre-removal step, was a complete field check of all electrically operated equipment in the plant. Included in the inventory was such information as motor-nameplate data; rating of ovens and furnaces; voltage of control circuits and special equipment; type, size and make of motor starters, contactors and disconnect switches. Motor data was entered on standard motor record cards—one card for each motor.

Complete inventory records, separated into major groups, listed the quantities of various items requiring conversion. Table I presents a resume of this list.

Motor rework was by far the most expensive and attention-demanding item of conversion. Chance Vought's move had been set up over a period of a year. Aircraft production continued uninterrupted both in Stratford and in Dallas during this period. Machines were scheduled to be moved when their work on a certain contract was finished in Connecticut. Upon arrival in Dallas they were immediately connected for operation. Hence, they were constantly in use except for the time in transit and rewinding.

A small number of spare motors was utilized to the fullest extent to release

as many motors as possible for rewinding prior to the scheduled moving date. Spare-motor coverage was far from complete and did not include special or multi-speed motors.

To take advantage of the combined capacity of several branch shops located within easy trucking distance, a large electrical manufacturer's service shop was selected to rewind motors. Moving schedules could be set without considering motor shop rewinding capacity. All motors sent out were checked for mechanical condition, and bearings were replaced where necessary.

Motor starters on most of the equipment were oversized for a 480-volt system. However, this equipment was left in service to avoid the expense of

purchasing new starters and rewiring machinery to mount smaller starters. A change of motor starters would have made surplus a substantial portion of the 1000 magnetic starters, mostly of the larger and least-used sizes.

Motor starter control circuit voltages varied from 230 volts for the simple stop-start type of magnetic relay to special voltages for relay coils, solenoids, transformers, rectifiers and similar components of special control panels for the most complicated machine tools. A small number of machine tools, recently purchased, were equipped with control panels incorporating all components mounted in a common enclosure, including disconnect and a control circuit transformer with reconnectable primary. This type of control is readily convertible from 220 to 480 volts by changing thermal elements and reconnecting primary loads in the control transformer.

TABLE I
Electrical Item Involved

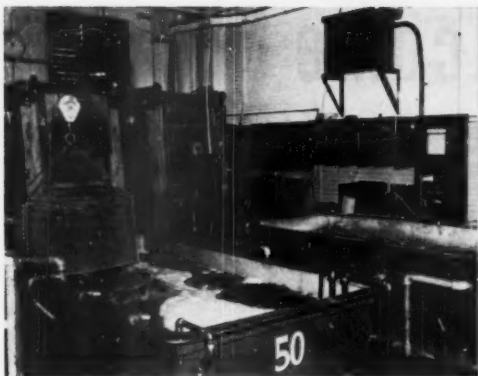
| Equipment | Quantity |
|---------------------------------------|-------------|
| Motors—total | 1600 |
| —dual voltage | 950 |
| —requiring rewind | 650 |
| Motor starters—total | 1600 |
| —requiring change of thermal elements | 1600 |
| —replaced | 25 |
| —requiring rework of control circuit | 1000 |
| —manual | 600 |
| Safety switches—replaced | 675 |
| Ovens—reconnected | 4 |
| Furnaces | 8 |
| Salt bath furnaces | 5 |
| Platens and heated dies | 30 |
| Spotwelders | 20 |
| Rectifiers | 30 |
| Special equipment | 60 |

Convert Starters

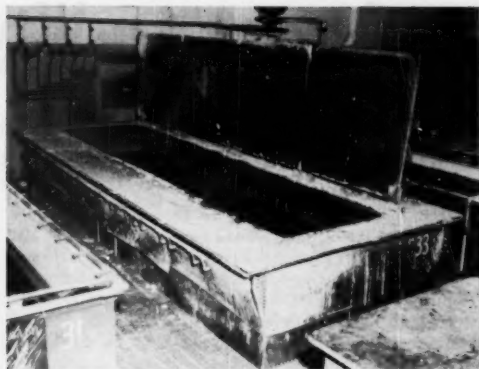
Control circuit transformers were selected as the most economical method of converting motor starters. The installation cost was low. Generally, the cost of the transformer was offset by selecting sizes that would supply the control requirements plus a 100-watt lamp for supplementary machine lighting. This eliminated the need for a separate 110-volt circuit in the panels.

Thermal elements were changed in all motor starters to the ratings required by the motors at 480 volts. Considerable interchanging between starters of the same make was possible, but substantial quantities had to be purchased to cover all makes and sizes.

Fused safety switches rated 230 volts used on most of the machine tools were



HEAT-TREATING FURNACES could not be converted to 480-volt operation; are supplied by dry type transformers rated to fit each furnace load.



RECONNECTED SALT BATH of 150 kw. rating now has its 18 immersion heaters connected in nine series groups for balanced three-phase operation on 480-volt system.

made obsolete by the move. Replacements were made using 575-volt non-fusible disconnects to take advantage of the extensive busduct system which provides branch circuit fuse protection in the bus plugs. Safety switch replacement represented one of the major cost items of equipment conversion.

Four electrically heated baking ovens were scheduled to be moved to augment ovens that were available at the new plant. Ratings varied from 45 kw. to 165 kw. With each of these ovens, it was possible to reconnect elements in the heater assembly from parallel to series arrangements without difficulty and at a low cost. Oven conversion also required replacement of the fused safety switch and installation of a small transformer on the control panel to supply the control circuit and the temperature control instrument. Contactors were not replaced, to avoid the cost of new equipment.

Use Dry-Type Transformers

Eight electrically-heated, high-temperature steel heat treating furnaces equipped with resistance heating elements could not be converted to 480-volt operation by reconnection or replacement of elements. There was insufficient space to install adequate lengths of heating element material of satisfactory cross sections. Reduction in cross sections would have resulted in serious sagging of elements at high temperatures, and doubling the length of elements would have reduced the furnace capacity. These conversions were made by installing dry-type power transformers sized to fit each furnace. Transformer ratings ranged from 15 to 37½ kva., single phase,



NEW 220-VOLT BUS DUCT parallels existing 480-volt duct in laboratory. Low-voltage line is plainly stenciled.

grouped to supply three-phase loads; and up to 50 kva., three-phase. Use of these transformers made further modification unnecessary.

Five electrically heated salt bath furnaces were converted by connecting 230-volt, 8.3-kw. immersion heaters in series for 480-volt operation. Three large baths each require 18 immersion heaters, totaling 150-kw. of heating capacity. These heaters were connected into nine series-groups which operate as a balanced three-phase load. Two small salt baths, originally rated 75 kw. with nine immersion heaters, were modified to add one extra heater. The ten heaters were connected into five series-groups which operate as a reasonably well balanced three-phase load. The remainder of the conversion on this equipment consisted of changing thermal elements in circuit breakers used as disconnect switches and in-

stalling control transformers to supply the control circuits and temperature control equipment.

A number of electrically heated platens and metal-forming dies, with strip, tubular or cartridge heaters, ranged in power load from 0.5 kw. to 45 kw. at 230 volts. These were converted by changing to 110-volt heaters, using series connections or resorting to dry-type power transformers.

Twenty spot welders of the stored-energy type were, with one exception, directly reconnectable for 480 volts. One machine required a new welding transformer to replace the original equipment made without the extra leads to allow reconnection. Three, single-phase, ac welders being used at 480 volts required no modification.

A miscellaneous group of some 30 copper oxide and selenium type recti-

(Continued on page 201)

Coast to Welcome NECA

October convention in Los Angeles brings electrical industry spotlight to fast growing, dynamic Far West.

SCHEDULED for October 17 to October 20, the 1950 annual convention of the National Electrical Contractors Association will be held at the Biltmore Hotel in Los Angeles.

"Progress through efficient management and training" on which the program has been prepared for many months, is expected to provide the central theme of the convention discussion. In view of current national developments the policies formulated are also expected to develop the pattern of industry cooperation in the forthcoming mobilization of industrial resources for national defense.

While the varied facilities for recreation, sight seeing and relaxation on the balmy shores of Southern California are still a compelling attraction to those who will attend, growing tension on the international scene, mobilization plans and the urgent commercial problems resulting from large military requirements and economic changes will make the 1950 convention one of the most important in NECA history.

The West Coast meeting place will bring contractors to an area where mobilization plans are imposed on a fast growing economy. The era ahead is already in sharper focus along the Coast than in many other part of the country. Probably no other part of the country today offers such a good "case study" of the effects and potentials on construction of the kind of military-program - imposed - on - booming - construction-program that appears in the immediate future.

What is the construction picture on the Coast? How does it relate to other economic factors there? How does it relate to the national picture? The answers to these questions will be a useful frame of reference for those who will see the current activities there at first hand. Through the resources of the McGraw-Hill Economics Staff we have brought together some of the key data.

Korea and the rearmament program will not stop the Western construction boom. Western construction is booming because the West is growing. Rearmament will bring more workers to Western warplants—and increase the long-run demand for construction.

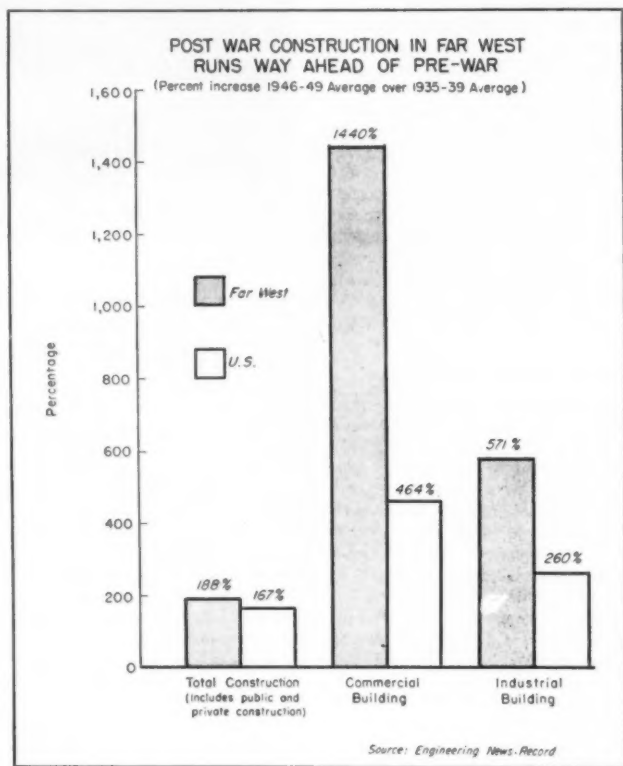
The population of the seven Western States—California, Oregon, Washington, Arizona, Nevada, Idaho and Utah—increased from 11 million in 1939 to 17 million in 1949. The construction industry has not yet caught up on the backlog of demand created by that growth. There is still need for more housing, more stores, more schools and hospitals. Until restrictions or material shortages become serious, construction will boom. Restrictions on construction may cut private work 15 to 20%, but war works and war industries will bring new demand for construction. That means a new backlog of civilian demand will grow.

The longer run prospects for Western construction are excellent. The

West's economy is dynamic; more industries are established every year. Population of the West will continue to grow rapidly for years to come. New technological advances open unprecedented vistas for Western industries.

The War Boom

The Western construction boom started with the last war—and there is no bust in sight. The war brought new industries to the West, and new thousands of workers. Aircraft factories, located in their infancy in the West, expanded. Oil refining was stepped up. Other industries needed for the war effort—chemicals, steel, light metals—were established or expanded greatly. The Pacific coast shipyards



were kept busy. The construction industry boomed. At the height of the war effort the West accounted for over a third of the total construction in the United States. And the number of industrial workers in the West increased from 610,000 in 1940 to 1,026,000 in 1945—a 68% increase in five years.

Postwar Expansion

With V. J. Day the Western war boom ended—but the people stayed and started new industries. In spite of a release of 75,000 workers by war plants, Western industries gained, compared with total U. S. manufacturing in the postwar years. In 1946 10.5% of U. S. manufacturing employment was in the West. The 1949 percentage was 15.5%. In three years the Western manufacturing employment increased by 44%.

Construction of industrial buildings for the expanded peacetime industries hit an all-time peak in 1948. Since then, as the backlog of demand diminished new contracts slowed down. The dip in new contracts was especially evident in the first six months of 1950. Still, for the postwar period as

a whole Western industrial construction increased by 571% over the 1935-1939 base period, compared with a 260% increase for the U. S. as a whole.

Postwar gains in commercial construction are even more spectacular than the increase in industrial buildings. Commercial construction, housing, stores, etc., depends upon the growth of population and upon the growth of income. The West's population has been growing five times as fast as the population of the U. S. as a whole ever since 1937. Income payments, high compared with the national average in 1937, also climbed faster than in the rest of the country.

Western construction of commercial building has shot up to a level 1440% above the base years 1935-39. In the West, as everywhere else, commercial construction had to catch up with the backlog of wartime demand.

Western housing more than kept pace with population increase. In 1939 the West had 8.6% of the nation's population, and 18.5% of the value of houses were put in place in the West. In 1948 the West accounted for 11.0% of the population, and 25.3% of the value of houses put in place.

Public building also swung into high gear in the postwar years. And the public building program is still on the increase. Almost twice as many contracts were awarded during the first six months of 1950 as during all of 1949.

The Next Ten Years

The near future prospects for the construction industry in the West are very good. What will be built depends partly, of course, upon the intensity of the armament program, and on the type and extent of restrictions. It now seems the most probable that there will be a gradual stepping up of war expenditures and a gradual introduction of restrictions. Such a program would help revive the Western war industries without eliminating completely commercial and public construction.

Industrial building in the West is likely to recover by the middle of 1951 from the low of the first six months of 1950 to a level only slightly below 1949. The emphasis will be on war plants and essential industries.

Housing is very likely to stay at the current record level during the early months of 1951. Gradual introduction of restrictions is likely to cut housing by some 20%. But new workers projects will be built. Other commercial projects are likely to be similarly affected.

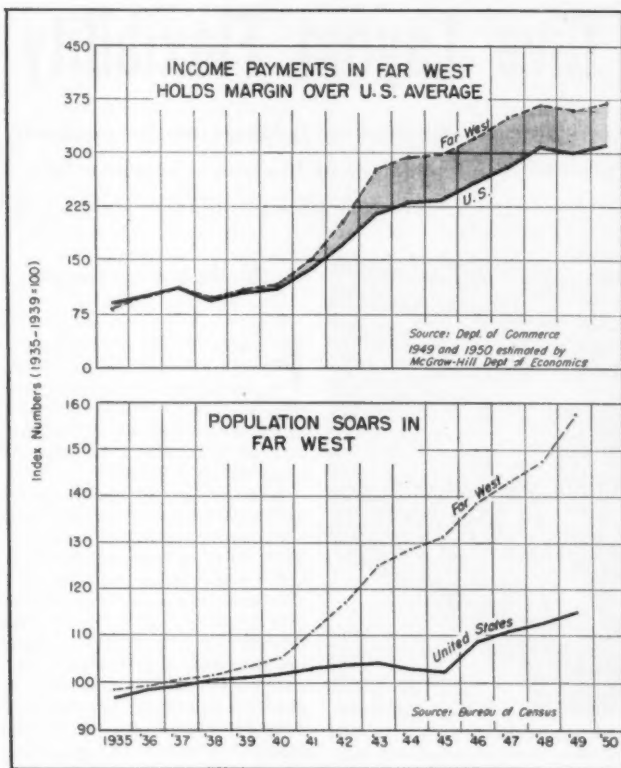
Public buildings are in a large part in the essential category. Short of an all-out war, schools will continue to be built. And hospitals will be needed in any case. Public buildings, as well as commercial buildings, would only be cut sharply in case of all-out war.

Long-Range Outlook

The prospects for the next 10 or 15 years are bright. The population of the West is growing fast. And a fast-growing population means a healthy construction industry.

The population of the West is getting younger—between 1940 and 1948 the Westerners aged 18 or less increased 40% faster than the older age groups. The growing young population needs more schools and more homes. More public and commercial buildings will be needed too.

Peacetime heavy industry is not likely to grow in the West unless new energy sources are harnessed. Only Atomic Energy can replace the missing coal. Further large-scale irrigation of the remaining arid areas of the West could give a new stimulus to the West's agriculture, and to the processing industries.





MODERN SLIMLINE LIGHTING with 4500-degree white G. E. lamps and flexible power network system are features of new addition to Greist Manufacturing Company's plant at New Haven, Conn.

Bus Circuits Give Layout Flexibility

Air transformers plus low current bus circuits to machine and lighting taps give quick access to electrical system for changing plant needs. An analysis of Electrical Contractor Otto H. Schulz & Co's. wiring installation at the Greist Manufacturing Co. plant in New Haven, Conn.

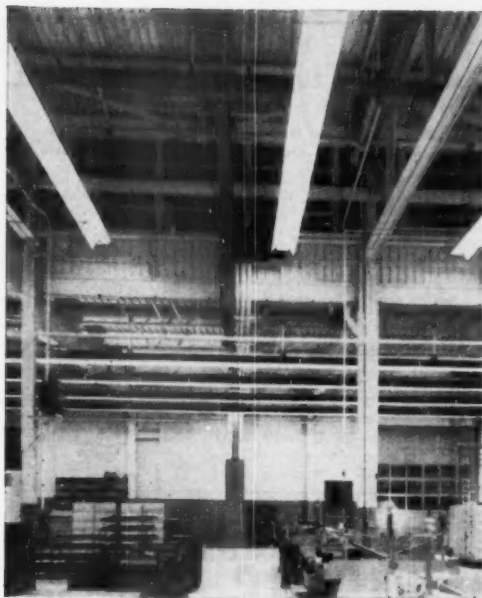
By Berlon C. Cooper



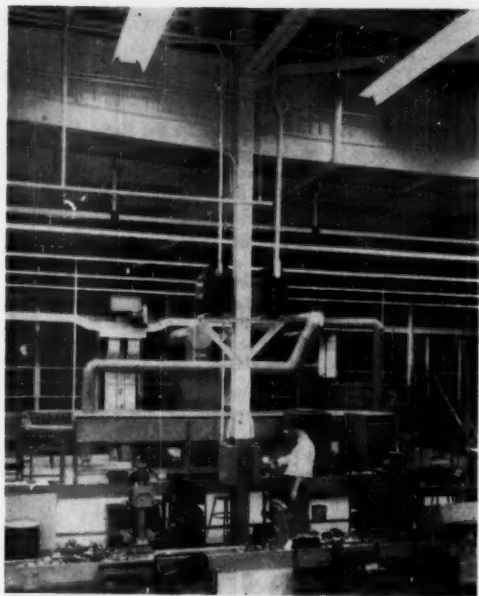
DIFFUSE general lighting of over 80 footcandles maintained eliminates need for local lighting. Use of high reflectance pastel green paint on ceiling and side walls improves appearance of room and aids efficiency of lighting system.

PLANNING problems on the electrical system for the new addition to the Greist Manufacturing Company plant in New Haven, Conn., included the need for fitting the wiring and lighting systems to production requirements.

A major part of Greist's present production is on aircraft, automobile and sewing machine components. These parts are manufactured to exacting specifications, and machined to very small tolerances. This high degree of accuracy made it essential that the workers be provided with modern machinery and production tools, and with a modern high intensity glare-free lighting system. Further, to meet the requirements of continued progress in manufacturing methods, the wiring and lighting systems both



BUS DUCT NETWORK, Trumbull FVK Flex-A-Power, extends from main switchboard through vertical riser on side wall to horizontal runs across ceiling.



TRANSFORMERS on columns, G. E. two-core air-type, fed from three-phase bus ducts, supply 120/240 volt single phase power to lighting branch circuits and to polarized outlets.

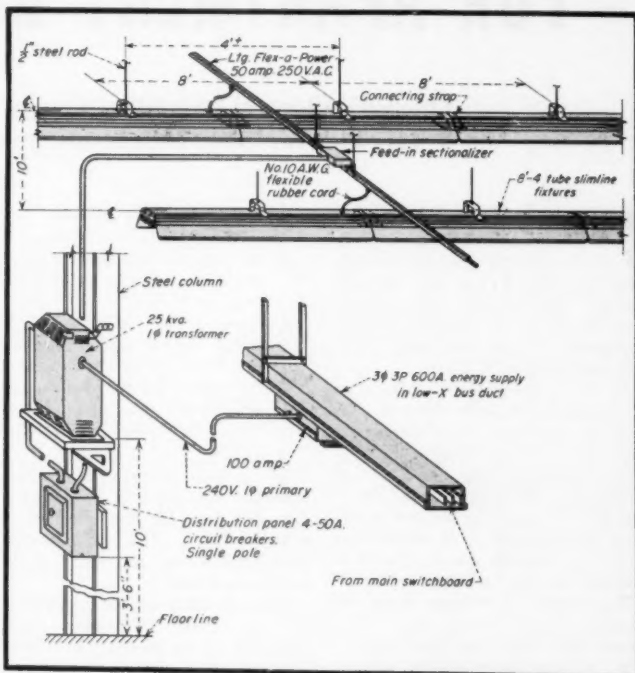
had to be readily adapted to plant changes and expansion.

Electrical energy is supplied to the plant at 2400-volt, three-phase, three-wire, 60 cycle primary. Three 150 kva. transformers convert this energy to 240-volt, three-phase secondary. A three-bus, low reactance bus duct, having 1600 amps. copper capacity per phase, was selected to deliver this energy to the main switchboard.

A power network feeder system was selected to deliver energy from the main switchboard at 240 volts, three phase, to the various load centers. Feeders consisted of 600 amps., 400 amps., and 225 amps., three-bus, low reactance bus ducts.

At strategic locations, 15 and 25 kva., two-core, air-type transformers were installed on the steel columns at the dividing line between the high bay and low bay areas. These transformers are fed on the primary side with a 240-volt single phase supply, tapped from the three-phase bus duct feeder system. Secondary rating from these transformers is 120/240 volt single phase, which is fed into and controlled by breaker-type panelboards, also installed on the steel columns directly under the transformers. From these panelboards, of the convertible distribution type and equipped with 50 amp. single pole circuit break-

(Continued on page 202)



POWER SUPPLY and lighting layout details for typical areas. Lighting units are plugged into Trumbull LTG Flex-A-Power wherever required. Power for machinery and for tools is available from overhead three-phase bus ducts, also from single phase circuit breaker panels on columns.

CIRCUIT REQUIREMENTS FOR APARTMENT BUILDINGS

SERVICE ENTRANCE—Service entrance and feeders to several living units to be calculated on basis prescribed by local codes and regulations using connected load and minimum circuits as specified in this Certified Adequate Wiring Schedule.

FEEDERS—Feeders to individual living units to be as follows: Area less than 1,000 sq. ft.—minimum sizes: 2 No. 6, 1 No. 8. Area 1,000—3,000 sq. ft.—minimum size: 2 No. 2, 1 No. 4. Areas over 3,000 sq. ft.—shall be designed to meet circuit and service entrance requirements of the above schedule. Distribution panel shall have position for electric range branch circuit and other required circuits.

BRANCH CIRCUITS—Minimum No. 12 A.W.G. wire size on convenience outlet circuits.

Lighting—One circuit for each 500 sq. ft. usable floor area.
Convenience Outlets—One circuit for each 500 sq. ft. usable floor area.

Kitchen—Two circuits, to two identified outlets in kitchen.
Laundry—One circuit.

Installed Equipment over 1,000 watts—One circuit per device.
Special Equipment Circuits—Range—Circuit position 35-A, 3-wire, 120/240-volt.

Spare Circuits—Two circuits per 1,000 sq. ft.; Minimum—2.

Recommended Additional Circuits—for specified equipment or future installations.

Air Cooling Equipment—depends on size of motors.

Clothes Dryer—30-A, 3-wire, 120/240-volt.

Dishwasher and Disposal—15-A, 2-wire, 120-volt.

Room Heater—20-A, 2-wire, 120 or 240-volt.

CERTIFIED WIRING FOR APARTMENT BUILDINGS

Chicago's Electric Association develops a Certified Wiring Plan for living units in apartment buildings.

CERTIFIED Adequate Wiring as it is applied throughout the country is primarily confined to single dwelling units—homes built for sale or rent. No apparent standards have been developed for multiple-dwelling construction—apartment hotels, flats and apartment buildings.

In Chicago, the electrical industry is promoting adequate electrical systems for the home owner and apartment tenant. The Electric Association's Certified Wiring For Electrical Living plan embodies the principles of the NAWB set-up for residences and goes one step further. It also includes a separate schedule for living units in multiple-dwelling buildings.

To obtain a certificate under the Chicago plan, a wiring system must contain these four basic elements:

1. A three-wire 120/240 volt or equivalent service ample for present as well as future needs.
2. A main service distribution center with sufficient capacity to

assure the conveniences and comforts of electrical living.

3. An adequate number of properly distributed circuits to eliminate overload hazards.
4. Convenience outlets every 12 linear feet of wall throughout the home or apartment, heavy duty outlets for the kitchen, convenient wall switches for all fixtures and also for selected outlets.

Of the two comprehensive wiring schedules developed by the Association, the one for multiple-dwelling units is shown. Also listed in table form are the service, feeder and circuit requirements.

Administration of the program is the responsibility of qualified representatives of the Electric Association who contact all new residential construction projects; suggest plan modifications to conform to Certified standards; supply wiring schedules and refer owners and architects to

local area electrical contractors if requested.

Following an initial roughing-in inspection and a final inspection, Certification is awarded if the system meets the specified requirements. Certification Awards are of two types:

Class A—If the listed requirements are met.

Class AA—If, in addition to listed requirements, a circuit extension from distribution panel to range outlet is installed.

Through this promotion, the Electric Association and the entire electrical industry in Chicago hope to bring the benefits of modern wiring to the thousands of families who may become tenants in newly constructed apartments and thousands more who may buy or rent a new home. While designed primarily for new construction, the recommendations of the Certified Wiring program can be applied effectively to rewiring projects in existing residential buildings.

SCHEDULE OF WIRING, CERTIFIED FOR ELECTRIC LIVING, FOR LIVING UNITS OF MULTIPLE DWELLING BUILDINGS

This guide provides for a system of wiring, conveniently controlled, which will under normal circumstances assure the enjoyment and benefits inherent in Electrical Living.

The installation shall also conform with local electrical codes and regulations.

| | LIGHTING OUTLETS | | | | WALL SWITCHES | CONVENIENCE OUTLETS | SPECIAL OUTLETS |
|--|---|----------------------------------|--|---|--|--|--|
| | PERIMETER (border of room) valance, cover or strip. | CEILING | WALL | WORK AREA | For control of ceiling and convenience outlets. Mount on latch side of door. S ₁ SINGLE POLE SWITCH For rooms with one entrance, or main light from two places, one switch for each place. S ₂ 3-WAY S ₃ 4-WAY S ₄ SWITCHES The 3-way switches to control same light from two places. The 4-way switch to control same light from three or more places. S ₅ MULTI-OUTLET ASSEMBLY. For areas where many appliances are used and moved about. | Mount 12 in. above floor or 12 in. above work counter. Multi-outlet assembly. For areas where many appliances are used and moved about. | ELECTRIC CLOCK OUTLET VENTILATING FAN OUTLET ELECTRIC RANGE OUTLET SPECIAL PURPOSE OUTLET |
| LIVING ROOM, LIBRARY, DINING ROOM AND RECREATION ROOM | 1 per 100 sq. ft., or 1 per 150 sq. ft., or major fraction thereof. | 1 per 150 sq. ft. | For decoration and mirror lighting and where ceiling outlet cannot be installed. | One for each individual work center | 1 on main light unit. 1 on convenience outlet. | 1 each 12 ft. wall space and each section 3 ft. or more long. For kitchen, wall section more than 6 ft. from an outlet. | |
| BED ROOM AND RECEPTION HALL | Same as above | Same as above | | | 1 on main light unit 1 or more | Same as above | |
| DINING AREA | 1 per 100 sq. ft., or 1 over table | 1 over table | | | 1 on main light unit 1 or more | Same as above | |
| KITCHEN & KITCHENETTE | 1 or more (work area & ceiling lighting may be combined) | 1 for gross area over 40 sq. ft. | | 1 per 4 ft. of work counter length, including sink. | 1 on sink light. 1 or more. | 1 for each 6 linear ft. of work counter, 2 of these to be identified outlets on separate circuits. 1 for refrigerator. | Electric Clock Outlet Kitchen Ventilator |
| HALLS | 1 | 1 per 12 linear ft. | OR 1 per 12 linear ft. | | 1 | 1 per 16 ft. of hall length. | |
| BATHROOMS | | 1 | 2 at mirror | | 2 | 1 near mirror away from faucet | |
| LAVATORY | | 1 | OR 2 | | 1 | 1 | |
| CLOSETS (24 inch or more deep) | | 1 near door | OR 1 over door | | | | |
| CIRCULATING AND SERVICE AREAS Electrical requirements shall be designed by the architect or consulting engineer to conform to local electrical codes and regulations. | | | | | | | |
| ELECTRIC ASSOCIATION | | | | | | | CHICAGO, ILLINOIS |

RECOMMENDED OUTLET SCHEDULE for individual living areas in multiple dwelling buildings. Apartments with the number of outlets listed, conveniently controlled and served by the recommended circuits, will provide tenants with adequate facilities to enjoy the conveniences of electrical living.

How to Estimate Electrical Work—8

How to appraise labor units and compare data with job experience.

LABOR units are usually treated with a lot more respect than they deserve. No matter how accurately they are derived they cannot represent universal values. They are always approximations. The best tables of units or labor-unit manuals are carefully derived from actual experience. Their great value is in their consistency and detail. It is relatively easy to check individual units from time to time and amend them as conditions warrant. By using them with the proper operator on finished jobs and comparing the total with actual job performance a very accurate appraisal is possible.

The ultimate test, however, is whether the proper and methodical use of a set of labor data, with appropriate modification for job conditions does, in fact, accurately predict your costs.

Job data

In a going concern, actively engaged in electrical work, with good cost accounting methods, the job files will provide a good quantity of accurate data directly related to job experience. Such data is specific. It affords an unquestionable insight into actual performance.

The first article in this series (January 1950, page 52) touched on the method of checking estimating method against job data. The job envelope contains exact "take off" and payroll information on a finished project. By treating the material list as a take off, pricing and extending by your conventional estimating methods, applying your usual operators or "job factors" the resulting "estimate" can be compared directly with actual performance. If it is "high" or "low", a relatively simple adjustment of the efficiency operator will bring your estimates into line with your experience.

Most estimators, however, have some method of estimating labor which, in their experience, has proved reliable and reasonably accurate. The data may be crude averages "per outlet", or the elaborate data of a comprehensive manual. The estimator may wish to expand his own data, work in data from other sources or adopt a more detailed and accurate technique.

By W. T. STUART

The simple comparison method described here is adaptable to almost any kind of electrical work and can be elaborated upon to give any desired precision in comparing data. While only one pricing sheet is used here it is of course, better to use several from different types of jobs if a critical comparison is needed.

Example

In the accompanying example three sets of unit data are compared. A portion of an estimate dealing with a quantity of exposed wiring in a utility building is used for the comparison. The building is steel frame, brick walls, slab roof, no interior finish. Runs are square, wiring is in conduit with threaded fittings.

Column A of the example represents a contractor's "known" data. It is assumed that this data has been used by him on enough jobs to give, with the proper "efficiency" operator, accurate estimates for his organization, management and man power.

Column B represents labor units from another source which he wishes to compare and test for this type of work. Sets of labor units are usually derived from a breakdown of relatively large segments of a job. Direct comparison of individual units, therefore, is not practical since the "weight" of the time analysis may be concentrated on different items of material. In the comparison shown for instance, the A units are weighted heavily on the fittings with less on the conduit. The B units are weighted more heavily on the conduit, less on the fittings. Selection depends upon experience.

A third column, C, compares the detailed labor unit method with a rough "per outlet" unit still widely used for branch circuit labor estimating. Such units cannot be precise but because they are usually derived from actual job experience, come surprisingly close on conventional work. Residential, apartment, shopping center store and office and similar work of relatively simple layout can often be

figured accurately with such "simple" units.

Column C is also used in the example to show how a detailed set of labor units may be compared with "known" outlet units. The job is figured in detail using the units which are to be tested, then extended in terms of the "known" outlet units. The percentage required to correct the detailed estimate to the "known" total can then be used as an efficiency operator for further use of the detailed method on the same type of work.

Summary

To compare "known" units with other data:

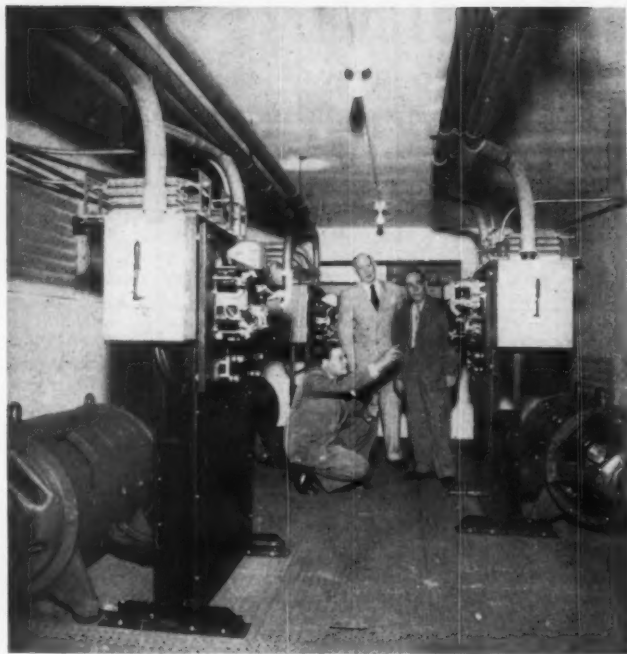
1. Apply "known" data to one or more estimate pricing sheets, extend and total. (as col. A in the accompanying table.)
2. Apply "other" data to the same listing, extend and total. (as col. B)
3. Use your conventional efficiency operator on the "known" data total to find net labor hours. Example: 886 hours, total A, efficiency operator 1.10, gives 975 net labor hours.
4. Find efficiency operator required to correct "other" total to above net labor hours. Example: 995 hours, total B, to give 975 net labor hours would require an efficiency operator of .98.

To compare unit labor data with "known" outlet labor averages:

1. Apply unit labor data to a detailed listing of material (as col. A), extend and total.
2. Apply "known" outlet units to outlets in listing, (as col. C), extend and total.
3. Use conventional efficiency operator, if any, on 2 above, to find net labor hours. Example, 906 hours, total C; efficiency operator 1.00, 906 net labor hours.
4. Find efficiency operator required to correct labor unit totals to net labor hours of 3 above. Example: 866 hours, total A, to give 906 hours would require an efficiency operator of 1.05.

Utility Bldg. — Exposed work — Table I

| Material | Quantity | A | | | B | | | C | | |
|---|----------|------------|-----|----------------------|------------|-----|----------------------|------------|-----|----------------------|
| | | Labor Unit | Per | Labor-Hrs. Extension | Labor Unit | Per | Labor-Hrs. Extension | Labor Unit | Per | Labor-Hrs. Extension |
| Ceiling Outlets (E-1)..... | 161 | .50 | E | 80.5 | .33 | E | 53.1 | 3.00 | E | 483.0 |
| Bracket Outlets (S4171)..... | 15 | 36.00 | C | 5.4 | .25 | E | 3.8 | 3.00 | E | 45.0 |
| Receptacle Outlets (FS and Covers)..... | 52 | .50 | E | 26.0 | .42 | E | 21.8 | 3.00 | E | 156.0 |
| Switch Outlets (FS and Covers)..... | 63 | .50 | E | 31.5 | .42 | E | 26.4 | 3.00 | E | 189.0 |
| Ceiling Switch Outlets (H-1)..... | 11 | .50 | E | 5.5 | .42 | E | 4.6 | 3.00 | E | 33.0 |
| 1/2 in. Entrances..... | 30 | 24.00 | C | 7.2 | 10.00 | C | 3.0 | | | |
| 3/4 in. Entrances..... | 26 | 27.00 | C | 7.0 | 12.10 | C | 3.1 | | | |
| 1 in. Entrances..... | 4 | 45.00 | C | 1.8 | 14.30 | C | .6 | | | |
| 1/2 in. Conduit..... | 2,830' | 2.10 | C | 59.4 | 6.60 | C | 187.0 | | | |
| 3/4 in. Conduit..... | 1,850' | 2.70 | C | 50.0 | 7.70 | C | 143.0 | | | |
| 1 in. Conduit..... | 430' | 3.80 | C | 16.3 | 10.00 | C | 43.0 | | | |
| 1/2 in. T Fittings and Covers..... | 45 | .80 | E | 36.0 | .38 | E | 17.1 | | | |
| 3/4 in. T Fittings and Covers..... | 89 | .90 | E | 80.1 | .33 | E | 29.4 | | | |
| 1 in. T Fittings and Covers..... | 14 | 1.10 | E | 15.4 | .40 | E | 5.6 | | | |
| 1/2 in. L Fittings and Covers..... | 34 | .65 | E | 22.1 | .28 | E | 9.5 | | | |
| 3/4 in. L Fittings and Covers..... | 29 | .70 | E | 20.3 | .33 | E | 9.6 | | | |
| 1 in. L Fittings and Covers..... | 8 | .80 | E | 6.4 | .40 | E | 3.2 | | | |
| Receptacles, single..... | 7 | 25.00 | C | 1.8 | .36 | E | 2.5 | | | |
| Single Pole Switches..... | 33 | 25.00 | C | 8.3 | .36 | E | 11.9 | | | |
| 3 Way Switches..... | 30 | 40.00 | C | 12.0 | .64 | E | 19.2 | | | |
| Receptacles, duplex..... | 41 | 25.00 | C | 10.3 | .36 | E | 14.8 | | | |
| Ceiling Switches..... | 11 | 40.00 | C | 4.4 | .36 | E | 3.9 | | | |
| No. 12 DB Solid Wire..... | 15,500' | 11.00 | M | 170.5 | 9.80 | M | 151.9 | | | |
| No. 12 Lead Solid Wire..... | 400' | 13.20 | M | 5.3 | 20.00 | M | 8.0 | | | |
| Fastenings on Conduit and Fittings..... | 914 | 20.00 | C | 182.8 | .24 | E | 219.0 | | | |
| Total..... | | | | 866.3 | | | 995.0 | | | 906.0 |



ELEVATOR PENTHOUSE houses self-excited m-g sets, disconnects and gearless traction motors. Conduit between disconnects and m-g switchboard is ceiling-mounted, using slotted hangers and straps. Temporary feeder kept elevators in operation during installation of new units.

The Union Bank & Trust Co. of Los Angeles is providing greater electrical capacity and safety for the future by installing new service facilities, switchgear, wiring and controls without interrupting business activities.

By George Young
*Electrical Contractor
 Los Angeles, California*

Renewed Service Through Modernization

MODERNIZATION: New Lease on Life

Electrical modernization of the Union Bank and Trust Company's building goes beneath the surface, strengthening the internal structure, providing greater service, safety and electrical flexibility. It represents an investment of \$100,000 on improvements not visible to the public.

But the significance of this project is better appreciated when related to the spreading modernization movement evident throughout the entire downtown Los Angeles business district. Behind this movement is the Downtown Business Men's Association.

This association contends that modernization is the only way to combat obsolescence. It is educating property owners to the facts that modernization creates higher property values, preserves the business district, increases sales, maintains maximum tenancy, results in a more handsome business section and a better city.

To launch the program, nearly 2000 property owners were acquainted with the aims of the modernization movement. Over 15 percent of this number indicated that they would give serious consideration to the recommendation. Dozens of modernization projects already are in progress, while others are in final design stages. This is a long step in the right direction; a step deserving the backing of the entire electrical industry.

A MODERNIZATION program involving the complete revamping of power and lighting facilities in the 30-year-old Union Bank and Trust Company of Los Angeles has just been completed.

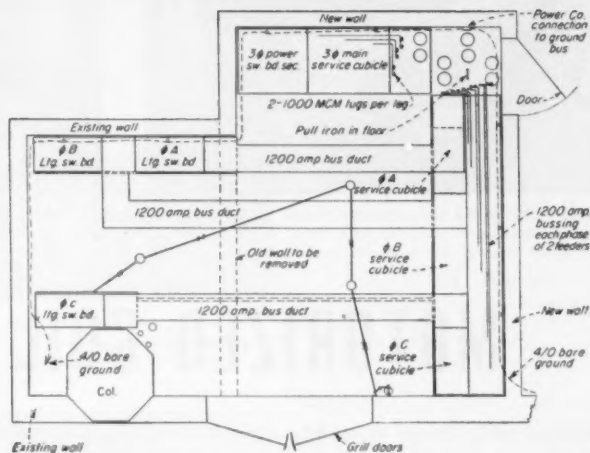
The program represents participation by consumer, contractor, architect and utility company and includes a larger service vault, new service feeders for both lighting and three-phase power, the elimination of dc service to the building by the installation of self-excited m-g sets, provision for greater circuit flexibility, and new high-speed elevators equipped for automatic dispatching. Old panel equipment has been replaced by circuit breakers, and the main switchgear has been replaced and relocated for greater convenience and safety.

The replacement of the main switchgear was particularly important for it solved several serious problems. For example; the former sub-sub-basement location adjacent to the boiler room had an excessively high ambient temperature and was exposed to the possibility of flood damage. The haphazard connection of loads had greatly unbalanced the three-phase lighting system. The omission of steel barricades between switching sections and the lack of feeder segregation constituted hazards, and the absence of switch identification promoted operational uncertainty.

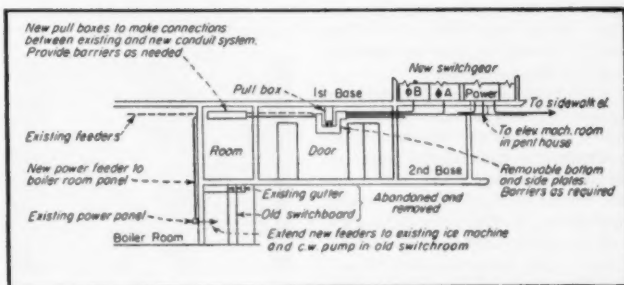
The new location in the first basement is cool, dry, safe from floods and readily accessible. Each of the three single phases of lighting service is provided with indicating and totalizing meters for accurate load balance checks. Construction of switchgear is in the form of a hollow square, with angle-iron and steel-plate safety cubicles front-operated and arranged for front-access. Breakers and equipment are securely supported to cubicle frames and cross struts rather than to enclosing front plates. Bus connections, between lighting service compartments and corresponding distribution switchboards on the opposite side of the hollow-square switchgear vault, are through ceiling-mounted ventilated bus duct. And all breakers are identified by Micarta name-plates, while a glass-enclosed bussing diagram clearly indexes all feeders, breakers and circuits. The installation is compact, engineered for maximum service and efficiently installed.

Due to the change of location, it was possible to erect the new switchgear before the existing service was interrupted. New feeders were installed as required and new branch circuits and control panels were positioned before the cutover was made. The final shifting of loads was effected outside of normal business hours, resulting in a complete transfer without disrupting the electrical service.

Modernization of elevator service, by replacing three existing dc excited m-g sets with new Westinghouse self-excited sets had three purposes; to eliminate a source of repetitive maintenance concern created by frequent insulation breakdowns due to the heat of the motor room; to eliminate the possibility of elevators slipping or dropping in the event of lost dc excitation, and to anticipate the future dis-



COMPACTNESS of arrangement, with front-access panels and overhead busduct connecting separated switchboards and service cubicles, solved problems of limited space. Corner space behind panel junction (normally unused) serves as shaft for feeders and power risers.



NEW SWITCHGEAR location is two floors above original position, solving problems of heat, moisture and accessibility. Existing risers and circuits were augmented to provide greater capacity. Cutover from old to new equipment was completed without curtailing normal tenant operations.



LARGE TURNTABLE has adjustable clamps for holding stators; can hold up to a 50 hp. unit; turns freely on rollers and thrust bearing. Here, mechanic adjusts tong clamp.



STRIPPING TABLE with motorized coil puller above turntable. Note that both of mechanic's hands are free to position clamps and rotate turntable. Burn-out booth is at right.

MOTORIZED COIL PULLER

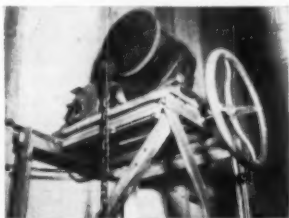
Gearhead unit above turntable cuts stator stripping time in St. Louis motor repair shop.

THERE are no grunts and groans, tugs or yanks, to remove old coils from stators in the shop of French-Gerleman Electric Co., St. Louis, Missouri. All of this energy is supplied by a motorized coil puller. The operator merely adjusts the pulling clamp and rotates the stator.

French-Gerleman's stripping table is adjacent to a stator burn-out booth. After stators have cooled, one side of the winding is cut and the frame is then bolted to a 36-inch diameter turntable ($\frac{1}{2}$ -inch steel plate) on the stripping bench. The turntable, welded to one-half a coupling with a 1-in. diameter shaft, rests on a thrust bearing and rotates on four rollers; has three long slots for the stator clamps; will take up to a 50 hp, 1800-rpm frame.

Directly above the turntable, and

mounted on an angle-iron frame, is the motorized coil puller. The unit consists of a $1\frac{1}{2}$ -hp, right-angle, gearhead motor on an adjustable base with large hand wheel for centering over the stator. On the motor shaft is one-



GEARHEAD MOTOR is the heart of the motorized puller. Shaft disk with eccentric bolt rotates at 42 rpm.; pulls coils on each turn. Large hand-wheel centers motor over stator.

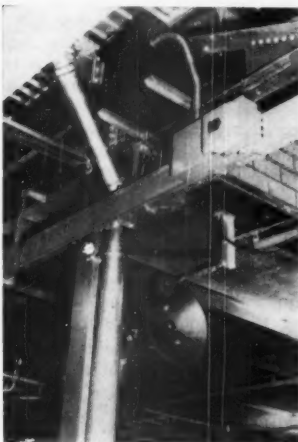
half of a coupling fastened to a 10-inch diameter steel disk ($\frac{3}{8}$ -inch thick). An eccentric bolt on this disk suspends a heavy link chain. On the other end of the chain is a bar-and-chain link attachment to a spring-tong with a double-lever action (the harder the pull, the tighter the grip). For smaller motors, the pulling chain is lengthened by inserting a long bar link; for larger units, a shorter link is used. The disk with the eccentric bolt rotates at approximately 42 rpm.

The motor is controlled by a knee-operated switch so the operator has both hands free. With one hand he sets and releases the pulling tongs; with the other he can rotate turntable to position windings for next pull.

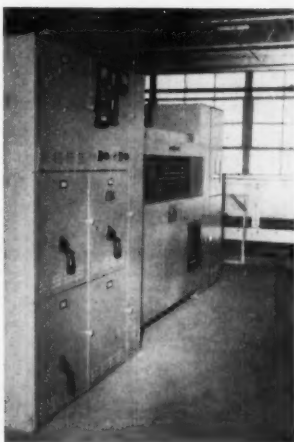
Mechanics in this shop find that it does a clean-cut job; are happy to let motor-power replace muscle-power.



PLANNING the location and space requirements of distribution and production equipment followed a logical order; using scale models to insure efficient arrangements. The physical limits of the buildings were determined after all electrical and manufacturing needs had been satisfied.



CAPACITORS for correcting power factor and dry-type transformers for lighting, unit heaters and tools are connected to the main 460-volt grid through plug-in devices. Current at 120/208-volts is via trolley duct.



TWO SUBSTATIONS, arranged back-to-back, are balcony-based in the central factory area. Lo-X feeder-ducts carry current across the plant, with parallel 600-amp busducts connected to these feeders at each column line.

FLEXIBLE DISTRIBUTION PLAN

Practical planning included flexible power distribution, combining bus-, trolley- and underfloor-duct, the extensive use of capacitors and voltage regulators, functional lighting and numerous production-boosting applications of power for Pesco Products' modern plant.

By E. M. Whalley

*Vice President and Works Manager
Pesco Products Div., Borg-Warner Corp.
Bedford, Ohio*

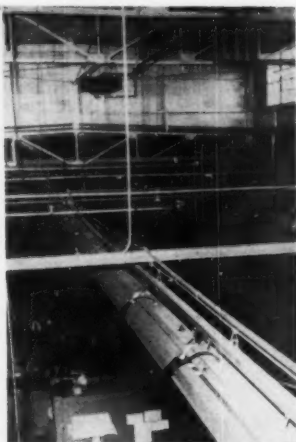
THE flexible electrical distribution plan of the new Bedford, Ohio, plant of Pesco Products, a division of the Borg-Warner Corporation, was developed from inside out.

Equipment to be housed was modeled to scale. These models were juggled around on a large working area until efficient production flowlines and the economical use of space resulted. Then, electrical distribution lines were projected through production centers. Substations, secondary transformers and capacitors were positioned to shorten branch circuits, improve power factor and cut voltage drops. Lighting was planned to deliver maximum footcandles where it was most needed—over machines, desks and work benches. Finally, building limits were determined and the physical shell of the plant was designed.

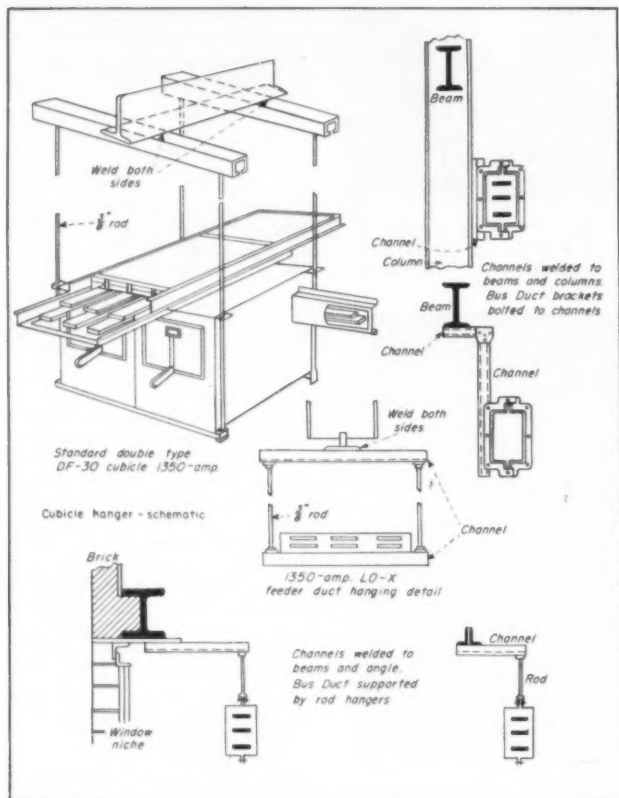
The result is functional efficiency. Compromises between required and available space were unnecessary. And the flexible requirements of a modern industrial organization were not re-



ILLUMINATION in the factory areas is supplied by 2-lamp industrial units suspended from trolley ducts which, in turn, are suspended from messenger cable strung from truss to truss or wall to wall and secured by anchors and turnbuckles.



TROLLEY DUCT utilization makes it possible to space lighting fixtures in accordance with the requirements of the areas served.



BUSDUCT is extensively used for interplant distribution with suspension methods including rod hangers, welded channels and busduct brackets. Connection of 600-amp ducts to 1350-amp feeders is by means of double-end fusible cubicles.

stricted by fixed facilities of an existing plant.

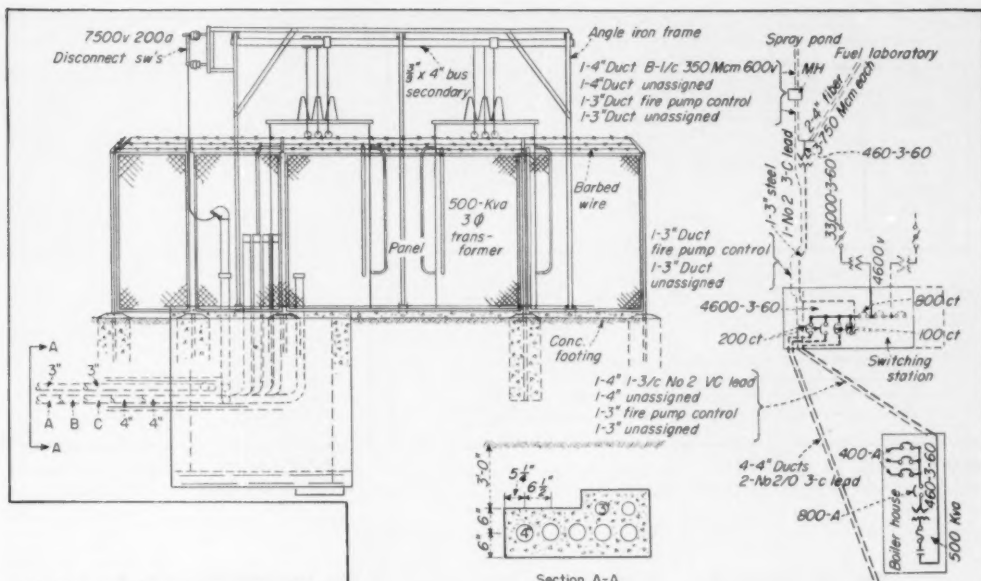
In the planning stage, each piece of existing equipment was visibly numbered. Locations of transformers, switchgear and busduct runs were carefully spotted. Models were marked correspondingly and, as soon as floor plans were drawn, these numbers were again noted in their planned positions. In moving, electrical connections were provided as soon as equipment was placed.

Since the old plant operated on 220 volt 3 phase current, it was necessary to convert all motors to 440 volt 3 phase for use at the new plant. Some of the motors could be reconnected for 440 volts, but a large number had to be rewound. Through the close cooperation with several repair shops in Cleveland, motors were rewound and returned for service within 36 hours. New starting equipment was provided at the new plant. Heating elements, switches and coils for the higher voltage had to be ready.

The entire move was completed without loss of normal production during the month the moving was in progress. The detailed planning paid off.

Electrical Plan

Utility power at 33 kv. is carried to an outdoor substation by overhead lines and is then stepped to 4600-volts through three 1000 kva. 60 cycle, 3-phase transformers delta connected. Distribution from substation to switching center, and from switching center

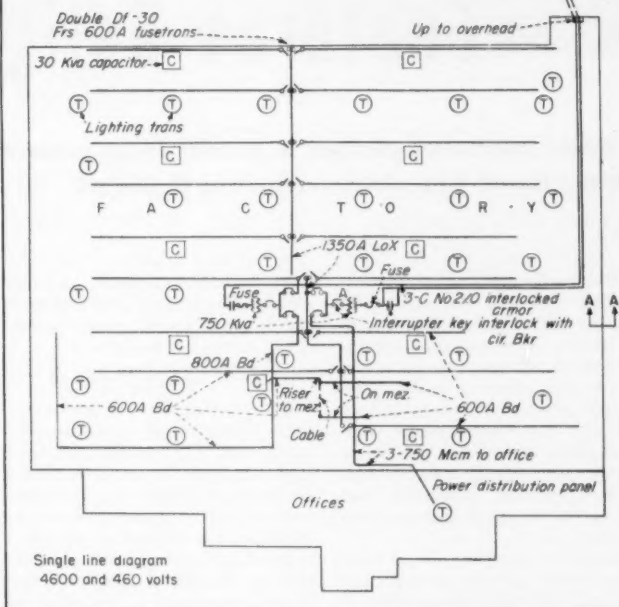


to load centers is underground, with heavy-walled fiber duct and 5-kva VC lead cables with grounded neutrals used for this purpose. There are 4600-volt circuits; two traveling to the main plant for factory and office service, one running to the boiler house, and the fourth extending to Pesco's fuel laboratory. At these four points, load-center transformers reduce current to 460-volts for power and, where required for hand tools and lighting, dry-type transformers again step voltages to 120/208.

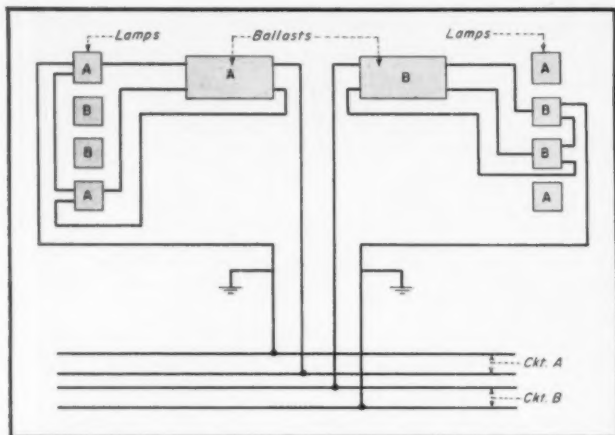
Primary circuits (4600-volts), are 500 MCM Geoprene. Cables are single conductor; paralleled where capacity dictates. The secondary feeders are connected to load-center transformers and switchgear from the bottom. All primaries are terminated on bus bar distribution to load center transformers. And factory load centers, for reasons of protection and floor-space conservation, are mounted on a central balcony, back to back.

Feeders running from these balcony-based substations to the outer limits of the plant are 1350-amp Lo-X busducts, supported by rod hangers and inverted channels every five feet. As structural column lines are crossed by these feeder ducts, double-end fusible cubicles (fused with 600-amp fuses) are installed to connect a series of parallel 600-amp 460-volt busducts with the main system. As is the case with feederducts, the 460-volt runs are supported every five feet and stiffener hangers are positioned on 20-

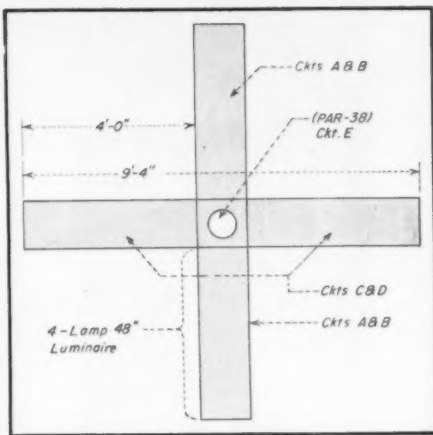
(Continued on page 206)



DISTRIBUTION is overhead to an outdoor substation, then underground via concrete-sheathed fiberducts to the various buildings. Interlocked armor in the factory building runs to two balcony-based load centers. Feeder-, plug-in, trolley- and underfloor-duct distributes current at 460- and 120/208-volt levels. Load factor is maintained at high level through use of 30-kva capacitors plugged into 600-amp 460-volt network. Total of all capacitors is 680-kvar. They are liquid cooled, confined in dust tight enclosures supported by brackets.



WIRING DETAIL of each four-lamp unit shows two outside lamps on one circuit, two inside lamps on another circuit.



FIVE-CONTROL SWITCHING was provided for each luminaire.

BANK MODERNIZATION

Features Relighting

Standard luminaires grouped in custom design geometric pattern integrates modern lighting layout with classic architectural design.

THAT modern lighting can be effectively combined with traditional architecture has been well demonstrated in a recent relighting job. Installation of this new lighting system was the main feature of a modernization program in the First National Bank and Trust Company bank building in Floral Park, New York. Other work involved in the modernization included rewiring, repainting, and replacement of the old draperies with new ones.

The main banking area is one large room, 36 feet wide by 60 feet long, with a 23-foot high ceiling. Tellers' cages and work areas extend along both sides of the room, while the center section serves as the customers' area. The ceiling of the entire room is divided into 15 equal bays, each twelve feet square, by heavy beam construction. The bottom of the beams

is approximately 20 inches below the actual ceiling, which is formed by 9-foot 4-inch square flat panels between beams in each bay area.

Former Lighting Inadequate

The old lighting system consisted of eight luminaires of the ornamental incandescent bare lamp type, suspended from outlets located in the bottom of the beams at points where the beams cross each other. Hanging seven feet overall, these luminaires created a cluttered appearance in the room, and gave an illusion of a lower ceiling height than actually existed. With the luminaires hanging at points one-third the room width from the side walls, uneven lighting resulted. Lighting intensities ranged from about three to ten footcandles, with the lower intensities prevailing in the work areas behind the tellers' cages.

In planning the new lighting system, the old lighting layout was ignored. The old incandescent luminaires were removed, and the old wiring system was abandoned.

The new lighting system takes advantage of the structural details of the ceiling. It is based on the use of one combination fluorescent-incandescent luminaire per bay, surface-installed in the center of the flat ceiling panels formed by the exposed beams. This luminaire was custom designed in the form of a cross, using standard lighting units. Each luminaire consists of four standard Pittsburgh Reflector Company 4/40-watt lamp four-foot long units, joined by a standard cross-over housing. The individual fluorescent units are of the "Tyler" design, with louver bottom and glass panel sides. The cross-over housing, which holds the fluorescent units at right



MODERN FLUORESCENT luminaires provide 60 footcandles of illumination for First National Bank and Trust Co., Floral

Park, N. Y. Original architectural treatment was maintained in relighting program.

angles with each other, contains a lampholder in the center for a PAR-38 150-watt incandescent reflector spot lamp with louver.

These combination luminaires were installed so that one axis of each luminaire was parallel with the side walls, and the other axis normal to the side walls. This layout gives an illusion of three continuous rows of fluorescent units from front of bank to rear, and of five continuous rows across the ceiling from side to side.

Wired for Flexible Control

Each luminaire contains 16 40-watt 3500-degree white fluorescent lamps and one 150-watt PAR-38 incandescent lamp. Instant-start ballasts were used, to eliminate the maintenance headache of starter switches. Wiring is such that 5-control switching is provided on each luminaire. The four outside lamps on the two four-foot long units on the same axis are controlled by one switch, and the four inside lamps on the same two units are on another switch. A similar switching

arrangement is provided for the other two 4-lamp units on the other axis. The 150-watt incandescent reflector spot lamp is on a fifth switch control. It is therefore possible to light the outside lamps of all units in each continuous row from the front of the bank to the rear, one row at a time, or in each continuous row across the bank, one row at a time. The same flexibility of control also obtains for the two inside lamps in each fluorescent unit. The incandescent spots are also controlled separately by rows from front of bank to rear. This flexibility in switching makes it possible to provide a wide range of lighting intensities in any part of the bank, to meet varying daylight conditions from the large window areas in one side and one end of the room.

Painting Aids Lighting

The lighting intensity, after four months' use, ranged from 40 footcandles at the walls, to 75 footcandles in the center of the room, with an average of 60 footcandles.

The draperies are a rich dubonnet color. The ceiling is finished flat white, with a reflectance of 80 percent, and the side walls are an old French blue with 55 percent reflectance. Furniture and woodwork are mahogany finish.

Painting of the ceiling and side walls in finishes having high reflectance values not only adds to the lighting efficiency, but also improves visual conditions and the appearance of the entire interior. While the reflection value of the draperies is low, on the order of ten percent, their rich color harmonizes by contrast with the effective pale blue finish of the side walls, creating a very pleasing effect.

Modernization also included the relighting and repainting of the board room located at the rear of the bank. Approximately 12 feet wide by 18 feet long, this room is lighted by a single 12-foot long Curtis "Anniversary" luminaire installed over the center of the board room table. Equipped with twelve 40-watt 4500-degree white lamps in four rows, it provides 30 footcandles over the entire table.



CIRCULAR WORK TABLE accommodates ten mechanics; has taping machines and coil vises; is the center of winding

department operations. Six men can work on the outer perimeter, four on the inside.

Boosting Winding Department Efficiency

STATOR winding in the motor repair department of the Roy A. Berentz Company, Houston, Texas, is concentrated in one corner of the vast shop area. Unlike layouts in numerous other shops, all winding activity here centers about a circular work table. Owner Roy A. Berentz and shop superintendent L. B. Davenport designed the unit to provide work space for ten mechanics—six on the outside and four on the inside. Associated equipment, coil spreader, winding head, and taping machine, are located around the table.

The doughnut-shaped table has a 14-foot outside diameter; a 3-ft. deep work area and access through a 30-inch gap.

Equipment concentration around circular work table cuts back-tracking and ups winding department efficiency in Houston shop.

The 36-inch high table is topped with $\frac{1}{4}$ -inch sheet steel and rests on a basic frame of 2-inch pipe. Three steel tool drawers, accessible from the inside area, are located on each side of and directly opposite from the entrance gap.

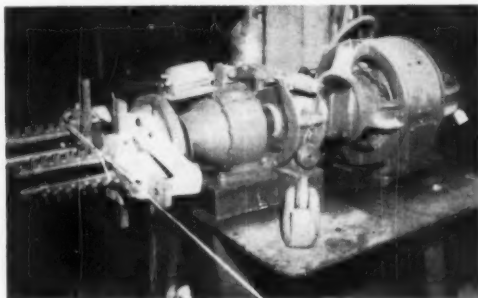
Mounted on the outside perimeter of the table are taping machines and coil vises. To provide 360° positioning

of coils during hand taping, Davenport designed a mushroom-type coil vise consisting of two 8-inch diameter steel plates operated by a foot pedal against a strong coil spring. Each plate face is lined with a $\frac{1}{4}$ -inch thick fiber disk to prevent coil damage.

Behind the table is a standard coil spreader; to the right, a winding head equipped with a Ward-Leonard speed control. Foot pedal operation first releases a solenoid brake on the winding head motor shaft, then connects the 5 hp., 1800 rpm., 230-volt dc motor to the circuit. Additional pressure varies the winding head speed (through a 4 to 1 gear reducer) from zero to 450 rpm.



MUSHROOM-TYPE VISES add flexibility to hand taping; permit coil positioning in 360° horizontal plane; are operated by foot pedal. Fiber disks prevent damage to coil.



WINDING HEAD is foot-pedal operated; has Ward-Leonard speed control and solenoid brake. Eccentric plate on head shaft operates ball bearing wheel on counter lever.

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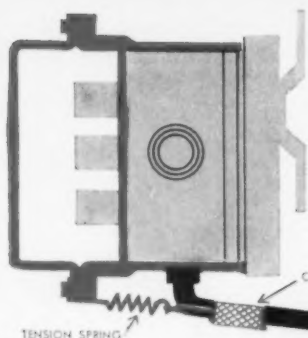
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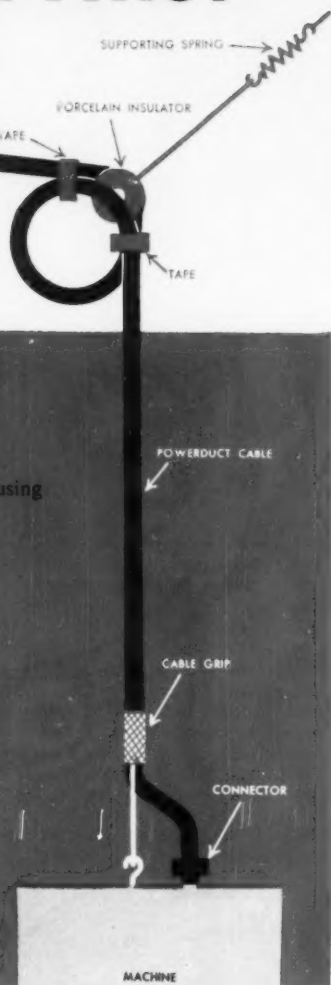
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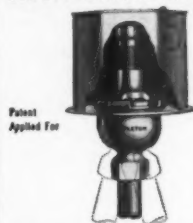
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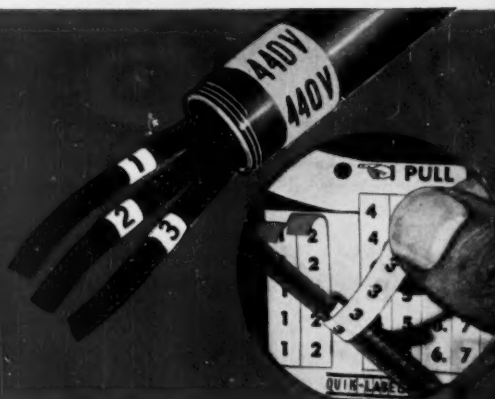
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| COST TO APPLY (At \$2.00 per hour) | 1/2c per label (maximum) | 1c per notch | 3c per tag | 2c per tag |



Save Time and Dollars

All Stock QUICK-LABELS are 1 1/2" long for wires up to .500" O.D. We can cut them in half to make two rows of 3/4" long labels as shown. This gives you twice as many labels on each card. There is no charge for this service. 3/4" QUICK-LABELS mark all wires under .210" O.D. Ideal for flagging smaller wires too. Make Brady QUICK-LABELS your Standard Wire Marking System. Simplify buying and storing. Eliminate costly, obsolete methods. Brady ships same day from OVER 1,000 DIFFERENT QUICK-LABELS IN STOCK.



PIPE MARKERS

QUICK-LABEL Pipe Markers conform to Am. Std. Assn. Pipe Identification System. Large letters on correct ASA background colors CAN BE READ UP TO 75 FEET. Stick without moistening. Write for Bulletin No. 135.

W. H. BRADY CO.

Manufacturers of Wire Markers and Other Self-sticking Tape Products

1616 E. Spring St.

Chippewa Falls, Wis.

... WHEN YOU GET IT ...



BRYANT OFFERS A COMPLETE LINE OF GROUNDING DEVICES

Designed for the grounding of exposed metal parts of portable appliances and electrical equipment, these devices protect against the hazards of electrical shock.

These devices may be used with either metallic or non-metallic wiring systems.

The special design of the grounding prong absolutely prevents its accidental engagement with the live contacts.

The outlets are of all bakelite construction and are provided with washer-type plaster ears and large head terminal binding screws for easy and secure wiring. May be side or back

wired. These devices comply with requirements of the National Electrical Code, and their use is being specified for various applications where grounding is desirable.

Duplex outlets are provided with a "break-off" feature permitting devices to be used for two-circuit installations.

When desired, these devices can be used in the conventional manner to accommodate standard 2-pole parallel blade caps.

All Bryant 3-wire grounding devices rated 15 amperes 125 volts.

3-WIRE CONVENIENCE OUTLETS



NO. 5262
Duplex, Brown
NO. 5262-I
Ivory



NO. 5261
Single, Brown

WEATHERPROOF OUTLET



NO. 5260
Single

3-WIRE CAPS

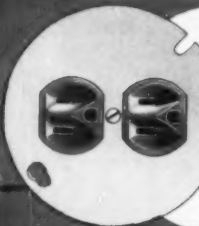


NO. 5264
NO. 5265
Armored with
Cord Grip



NO. 5263
Brown Bakelite
NO. 5263-I
Ivory Bakelite

BOX MOUNTING OUTLETS



NO. 5282
Duplex, Brown
NO. 5281
Single, Brown

3-WIRE CAPS



NO. 5274
Black Rubber



NO. 5276
Black Rubber
with Cord Grip

3-WIRE CORD CONNECTOR BODIES



NO. 5269
NO. 5270
Brown Bakelite with
armored Cord Grip

Listed as Standard by Underwriters Laboratories, Inc. Specify Bryant Device from Your Electrical Wholesaler

THE BRYANT ELECTRIC COMPANY

Bridgewater 2, Connecticut • Chicago • Los Angeles

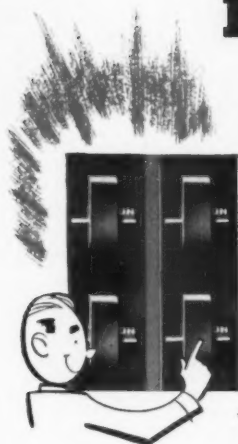
3-28846



YOU KNOW IT'S RIGHT..

Simplest switching with *Pushmatic*[®] ELECTRI-CENTERS

New convenience for customers
... new business for you!



Push—it's ON!

Push—it's OFF!

Push—it's ON
again!

*Push-button switch with automatic protection for electric circuits

NOTHING could be simpler! A simple push of the finger switches the current either ON or OFF. If Pushmatic is automatically tripped by short or overload, just push and service is restored. No bothersome resetting by hand... no fuses to buy. And simple push-button switching is just one of the many exclusives that make Pushmatic Electri-Centers first for circuit control and protection. Pushmatics offer flexibility never before obtainable in any panelboard!

All units interchangeable!

All Pushmatics are identical in size and contour, regardless of rating or type. That means each unit

can be quickly inserted, removed or interchanged without disturbing other units. Handle ties quickly convert two horizontally adjacent single-pole Pushmatics into two-pole branches.

Surest protection is another Pushmatic feature. Approved by Underwriters' Laboratories, quick-break Pushmatics operate with split-second precision when short or overload occurs. Automatic tripping is entirely independent of manual operation.

There's a Pushmatic to meet every load condition: THERMAL-MAGNETIC, or THERMAL-MAGNETIC with exclusive AMBIENT COMPENSATING FEATURES. They're rated at 15, 20, 30, 40 and 50 amperes, 1 pole, 120 V., or 2 poles, 120-240 V., AC.

For simplest switching, most flexibility, surest protection and fastest delivery, change to Pushmatic Electri-Centers for every panelboard job!

BULLDOG ELECTRIC PRODUCTS COMPANY

DETROIT 32, MICHIGAN • FIELD OFFICES IN ALL PRINCIPAL CITIES
IN CANADA: BULLDOG ELECTRIC PRODUCTS OF CANADA, LTD., TORONTO



BULLDOG

PIONEERS IN FLEXIBLE ELECTRICAL DISTRIBUTION SYSTEMS



1 Here's insurance for rush jobs! You're prepared for any order with a small supply of basic Electri-Centers and fronts plus...


2 several cartons of flexible, interchangeable Pushmatics, supplied by your local distributor. Here's how this small investment pays off:

3 When you have a hurry-up job, simply pick out the basic Electri-Center needed, hook Pushmatics on the mounting rib and connect them to bus bars with a screw driver.

4 No time wasted tracking down supplies! When time counts, you're prepared for any panelboard job with this small supply of flexible Pushmatic Electri-Centers!

... WHEN YOU GET IT ...

via
Graybar



"We stopped both useless shutdowns and motor burnouts from Single Phasing by installing Fusetron fuses in a refrigeration compressor circuit"

*Glenn F. Buschman, Manager
Kirby Risk Electric Motors, Inc.
Lafayette, Ind.*

Mr. Buschman continues—

"In December '47 we rewound a motor for the Rund Packing Company of Lafayette, Indiana that had been burned out on single phase.

"One week later the same motor came back, again burned out on single phase.

"We investigated and found that the motor was used on the refrigeration compressor and that starting currents were causing the 100 amp. 250 volt renewable fuses protecting the circuit to blow. When one of them blew it single phased the motor.

"The thermals in the starter were oversize and so the motor burned up.

"100 amp. FUSETRON dual-element fuses were installed in place of the ordinary fuses and the thermals changed to the proper size.

"The thermals have so far never had to operate because the FUSETRON dual-element fuses stopped the useless blows on the starting current. This automatically stopped the single phasing that had previously caused the motor burnouts."

FUSETRON FUSES

**TRUSTWORTHY NAMES IN
ELECTRICAL PROTECTION**

BUSS

★ Fusetron fuses have high interrupting capacity. Tests conducted by the Electrical Testing Laboratories of New York City in December 1947 showed that on a 240 volt 60 cycle 3 phase, 4 wire circuit set to deliver 90,000 amperes, 30, 60, 100, 200, 400 and 600 ampere 250 volt Fusetron fuses on each and every test cleared the circuit without belching flame and with comparatively little noise.

GIVE 10-POINT PROTECTION

- 1* Protect against short-circuits.
- 2 Protect against needless blows caused by harmless overloads.
- 3 Protect against needless blows caused by excessive heating — lesser resistance results in much cooler operation.
- 4 Provide thermal protection — for panels and switches against damage from heating due to poor contact.
- 5 Protect motors against burnout from overloading.
- 6 Protect motors against burnout due to single phasing.
- 7 Give DOUBLE burnout protection to large motors — without extra cost.
- 8 Make protection of small motors simple and inexpensive.
- 9 Protect against waste of space and money — permit use of proper size switches and panels.
- 10 Protect coils, transformers and solenoids against burnout.

FUSETRON is a trade mark of the
Buschman Mfg. Co.,
Division of McGraw Electric Co.



YOU KNOW IT'S RIGHT...

Fusetron^{DUAL-ELEMENT} Fuses

Give All-Purpose Protection

because . . .

The fuse link element opens on short-circuit — the thermal cutout element protects on overloads — the result, a fuse with tremendous time-lag and much less electrical resistance.

They have the same degree of Underwriters' Laboratories approval for both motor-running and circuit protection as the most expensive devices made.

Made to the same dimensions as ordinary fuses — fit all standard fuse holders.

Obtainable in all sizes from 1/10 to 600 ampere, both 250 and 600 volt types. Also in plug types for 125 volt circuits.

Their cost is surprisingly low.

Don't Risk Losses

- One needless shutdown
- One lost motor
- One destroyed switch or panel

may cost you far more than replacing every ordinary fuse with a FUSETRON dual-element fuse



MAIL THE COUPON NOW
for complete information about
Fusetron Fuses and their 10-point
all-purpose protection

Bussmann Mfg. Co., University at Jefferson St. Louis 7, Mo.
(Division McGraw Electric Co.)

Please send me complete facts about FUSETRON
Dual-Element FUSES.

Name.....

Title.....

Company.....

Address.....

City & Zone..... State.....

ECM9-50

WHEN YOU GET IT...





established 1889

Electric DRINKING WATER COOLERS



20 models of various sizes

to supply perfectly cooled refreshing drinking water for every industrial or commercial need.

normal conditions

room temperatures below 110°F

abnormal conditions

lint, dirt or dust in circulation; room temperatures 110°F or higher

explosive conditions

combustibles of various natures in suspension

All models have stainless steel top, stainless steel cold water storage tank and are available

1. with hand control only, or
2. with foot control only, or
3. with hand and foot control.

In addition to these and many other quality features, every Cordley Electric Water Cooler with hermetically sealed refrigeration system carries this unique five-year warranty.

Your Five Year Warranty

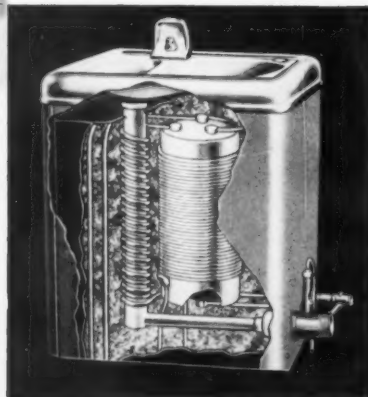
Every unit of Cordley Domestic Electric Water Coolers is protected for a period of five years from the date of installation. This warranty covers replacement of the entire cooling system in the event of a defect in the factory-made refrigerant system. Copy of the complete warranty will be supplied upon request.

MEET STRICT PLUMBING CODES

All Cordley Electric Bubbler-Type Coolers comply with sanitary codes, and also comply with plumbing codes of cities like Los Angeles, Chicago, Detroit and others to wit:

Round seamless copper tubing for water and/or refrigerant is **externally** bonded to stainless steel storage tank; and round seamless copper tubing for inlet water is **externally** bonded to seamless copper fully cleanable drain (pre-cooler). **Double wall construction provides positive protection against back siphonage.**

Condensers on water-cooled models are of double wall, double coil construction and are supplied with a vertical sight discharge fitting embodying a one inch vacuum break (as shown) to eliminate possible cross connection between condenser discharge and waste drain line.



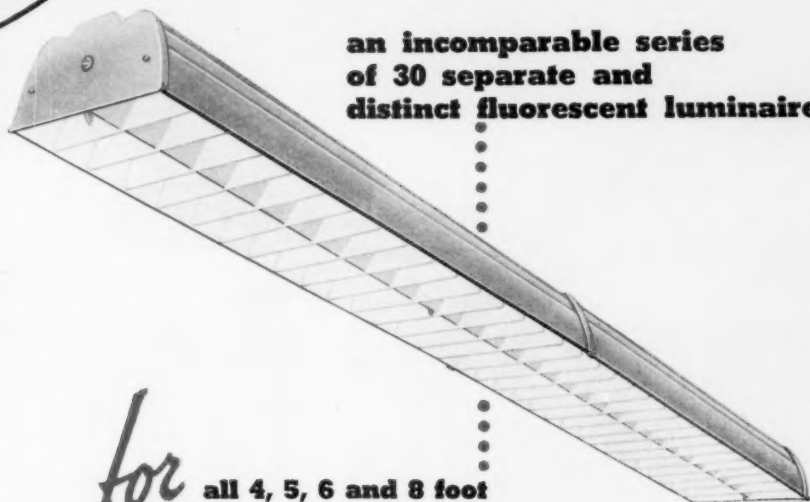
YOU KNOW IT'S RIGHT...

NEW CURTIS



CORONET

**an incomparable series
of 30 separate and
distinct fluorescent luminaires.**



for **all 4, 5, 6 and 8 foot
lamps . . . slimline, low-
brightness or starter type.**

The new Curtis Coronet Series is designed to provide unexcelled general illumination for all commercial interiors. Eye-comfort, traditional in Curtis lighting units is even more characteristic of this skillfully engineered line. Yes, now Curtis offers not only Quality . . . but "Quality with Features".

Shielded 40° crosswise with either 40° or 25° lengthwise shielding . . . offering the optimum in eye-comfort.

Alzak Aluminum or Baked White "Fluracite" steel reflectors . . . highest lighting efficiency.

Newly designed "Tong Hangers" speed and simplify installation . . . Lower installation cost.

Fingertip control louver catches permit relamping 32 feet of lamps from one ladder position . . . lower maintenance cost.

Bears Electrical Testing Laboratories and Fleur-O-Lier labels . . . guaranteed performance.

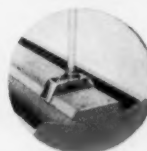
Curtis Tong Hanger already mounted, ready to receive wedge-top of luminaire wireway.



Tongs expand when luminaire is pushed upward in one simple motion. Edges of tongs catch under continuous ridge. Luminaire is released, weight pulls tongs together and assures a strong grip.



Simple lock nut above tong hanger is tightened and mounting is complete in a fraction of the time required by conventional methods.



Full technical details and specifications on the Coronet series are illustrated and described in Bulletin A-1. Write today for your copy. Address Dept. C-88.

Plan



CURTIS

LIGHTING, INC.
615 W. 52d ST., CHICAGO 20, ILLINOIS

QUALITY WITH FEATURES

... WHEN YOU GET IT ...



COFFING HOISTS

built for **LONGER USE**

backed by **BETTER SERVICE**

Here is a line of hoists built to stay on the job, reduce time-consuming break-downs, protect men and equipment with a wide margin of safety.

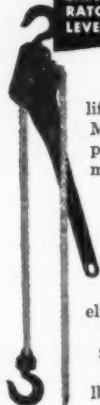
Prompt, efficient Coffing service, immediate shipment of replacement parts gives further assurance of complete satisfaction for years to come.

Choose the size and type to fill your requirements and find out for yourself that there is a difference in hoisting equipment.



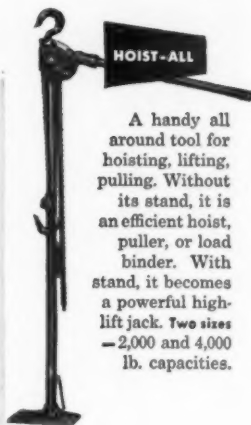
**QUIK-LIFT
ELECTRIC HOISTS**

Ruggedly built for the most continuous assembly line use. For long life, all moving parts are sealed, running in oil. For safety, parts are tested at 100% overload. **Seventeen models — 500 to 4,000 lb. capacities.**



**SAFETY-PULL
RATCHET
LEVER HOISTS**

A safe, sure lift for any load. Multiplies man power, protects men and equipment. Dual ratchet and pawl cannot slip or drop load. Safety valve handle eliminates overload dangers. **Seven models — 1,500 to 30,000 lb. capacities... factory tested at 100% overload.**



HOIST-ALL

A handy all around tool for hoisting, lifting, pulling. Without its stand, it is an efficient hoist, puller, or load binder. With stand, it becomes a powerful high-lift jack. **Two sizes — 2,000 and 4,000 lb. capacities.**



**SAFETY LOAD
BINDERS**

Powerful, highly portable, safe. Dual ratchet and pawl hold securely. Handle cannot fly up when released for another "bite." **Two models — 3,000 and 6,000 lb. capacities.**



**SPUR-GEARED
CHAIN HOISTS**

With extra heavy malleable iron castings, drop forged steel hooks, and special wear-resistant alloy steel in moving parts, these hoists stand up for years under the most demanding service...factory tested at 100% overload. Automatic brake holds load securely at any position. **Seven models — ½ to 5-ton capacities.**



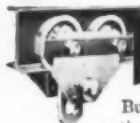
**MIGHTY-MIDGET
PULLERS**

Big pulling power in a small package. Light, compact, a Mighty-Midget hangs easily on a tool belt. Handle can be used either as a lever or a high-speed crank. **Two sizes. 500-lb. model weighs only 6½ lb. 1,000-lb. model weighs only 9½ lb.**



**DIFFERENTIAL
CHAIN HOISTS**

Widely used in warehouses, garages, and by contractors where speed is not essential. **Four models — ¼ to 1½ ton capacities.**



**I-BEAM
TROLLEYS**

Built for years of satisfactory service. Plain or geared types. Capacities up to 10-tons.

COFFING HOIST COMPANY

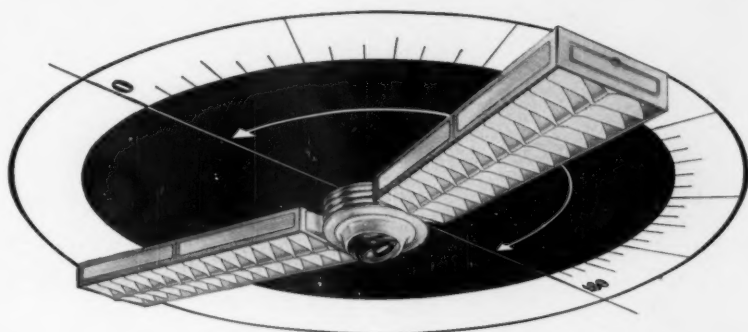
Danville, Illinois



YOU KNOW IT'S RIGHT...

Now! Real Lighting Flexibility!

PLEXOLINE is a new idea—an imaginative engineering creation that permits, for the first time, truly unlimited fluorescent lighting patterns at mass-production costs. PLEXOLINE is an ingenious system of related linear sections and circular accent units. Used in combination, these elements are capable of achieving curves, circles, any angular arrangement, rectangles, and straight continuous runs. Used individually, each element is complete in itself.



DAY-BRITE QUALITY MAKES Plexoline PRACTICAL!

The final test of an idea is how well it is carried out. PLEXOLINE promises spectacular new flexibility; famous Day-Brite quality *delivers* it . . . your guarantee of matchless year-in, year-out, trouble-free performance and low installation, maintenance and operating costs.

That's PLEXOLINE . . . a value-packed combination of versatility and PREMIUM QUALITY WITHOUT PREMIUM COST . . . the greatest advancement in fluorescent lighting history!

But you need the full PLEXOLINE story to properly judge its amazing advantages to you. Send for your free copy of "PLEXOLINE—IMAGINATION AT WORK." Just fill out coupon and mail . . . TODAY!



049

PREMIUM QUALITY
WITHOUT PREMIUM COST

"DECIDEDLY BETTER"
DAY-BRITE
Lighting Fixtures

Day-Brite Lighting, Inc.,
5402 Bulwer Ave., St. Louis 7, Mo.
In Canada: Amalgamated Electric Corp., Ltd.,
Toronto 6, Ontario

Please send me _____ copies of your free booklet, "PLEXOLINE
—IMAGINATION AT WORK."

Name _____

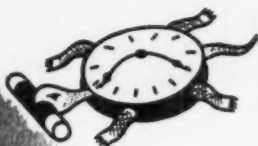
Firm _____ Position _____

Address _____

City _____ Zone _____ State _____

via
Graybar

... WHEN YOU GET IT.



SUPERIOR PROTECTION

... where "TIME-DELAY" is needed most!

With a reputation for Pioneering and Constant Improvement, ECONOMY has always made its Renewable Fuses and Renewal Fuse Links to meet the maximum of all requirements of "The Standard for Fuses".

"ECONOMY Time-Delay" Renewal Links, now offer superior protection where time delay is needed most—within the 135% and 200% range in which most overloads occur.

Because of the simplicity and unusually fine mechanical construction of "ECONOMY Fuses and Time-Delay" Renewal Links, renewal is quick and easy.

See your Electrical Wholesaler for the new "ECONOMY Time-Delay" Fuses and Links; he has them in stock.

SEND FOR NEW CATALOG

**ECONOMY
DE-LAY**
RENEWABLE CARTRIDGE FUSE

ECONOMY FUSE AND MFG. CO., 2717 GREENVIEW AVE., CHICAGO 14, ILLINOIS REPRESENTATIVES IN ALL PRINCIPAL CITIES

Copyright Reg. U. S. Pat. Office R-2203RRR

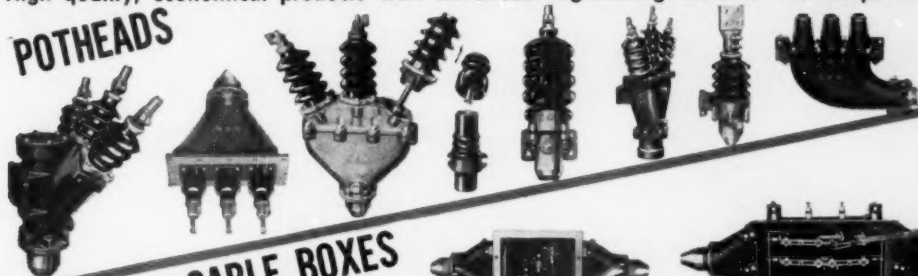


YOU KNOW IT'S RIGHT...

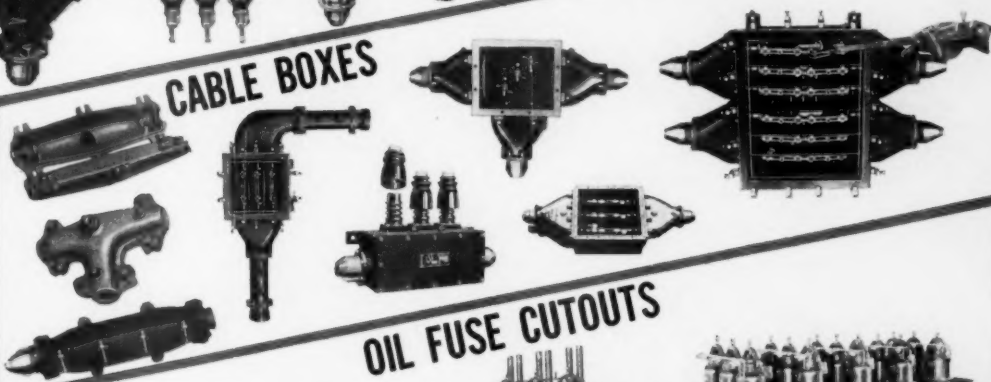
1905—45 **YEARS OF SERVICE**—1950
Specify **G & W** *cable devices*

High quality, economical products with advanced engineering features and simplified designs.

POTHEADS



CABLE BOXES



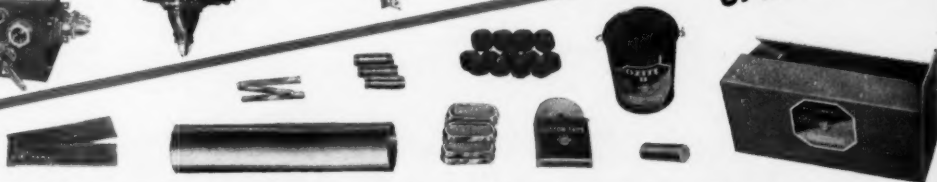
OIL FUSE CUTOUTS



OIL SWITCHES



SPlicing KITS



For detailed information write us or our representatives — there's no obligation.

G & W ELECTRIC SPECIALTY CO., 7780 DANTE AVENUE, CHICAGO 19, ILLINOIS, U. S. A.

Representatives in principal cities in U. S. A.

In Canada; Powerlite Devices, Ltd., Toronto

... WHEN YOU GET IT ...



5050
SERIES
2 LAMPS
48" fluorescent,
48" or 96"
slimline.

5054
SERIES
2 LAMPS
48" fluorescent,
48" or 96"
slimline.

2 LAMP
"THIN PANEL"
48" fluorescent,
48" or 96"
slimline.

ONLY ONCE IN A LIFETIME A FIXTURE LIKE . . .

Visualier

An engineering miracle! The only lighting fixture that combines

- 50-50 light distribution
- 45° x 45° shielding
- 77% lighting efficiency

And just look at these additional features! Fixture exterior illuminated for uniform low surface brightness and minimum contrast. Durable, rigid construction with louver shielding body formed from a single piece of metal . . . attached to body with combination hinge latches. Hinges down from either side or removable. Completely wired. Designed for quick, easy, economical installation individually or in runs.

Garco

**BETTER
LIGHTING**

For Stores, Schools, Offices

A complete new line . . .

"THIN PANEL" LUMINAIRES

Gracefully louvered and wafer thin, these fixtures are equally good looking whether surface mounted in low ceiling areas or suspended from higher ceilings. "Thin Panel" brings you a whole new set of lighting tools—32 separate lighting units that can be hung individually, coupled in runs or grouped in modular patterns on 12" or 16" grid. Choose between totally direct or direct-indirect lighting, sides of metal or translucent diffusing glass . . . 4 ft. units, 8 ft. units and square circline or circline-spot units to match.

WRITE FOR LITERATURE

4 LAMP
"THIN PANEL"
48" fluorescent,
48" or 96"
slimline.

GARDEN CITY PLATING & MFG. CO.
1730 N. ASHLAND AVE., CHICAGO 22, ILL.



YOU KNOW IT'S RIGHT . . .



TRUST... WELL PLACED

IN PROCUREMENT... Two fundamentals apply, always. 1. Pick yourself a reliable source of supply. 2. Specify a definite manufacturer's product, for quality's sake... This page displays two names to which you can pin your faith, under all circumstances. Everything you need is there—modern-specification insulation; quality-guaranteed construction; intelligent, cooperative service—"MORE POWER TO YOU".

GENERAL CABLE
CORPORATION

OFFICES IN PRINCIPAL CITIES

- BARE WIRES AND CABLES
- OK®—PEERLESS®—TIP-TOP® WEATHERPROOF WIRES
- GUARDIAN® BUILDING WIRES AND CABLES—THERMOPLASTIC AND RUBBER INSULATED
- ROMEX® AND ROMEX-T. NON-METALLIC SHEATHED CABLES
- VARNISHED CAMBRIC POWER AND CONTROL CABLES, THERMOPLASTIC AND THERMOSETTING JACKETED, BRAIDED, OR LEAD SHEATHED
- ASBESTOS AND ASBESTOS VARNISHED CAMBRIC WIRES AND CABLES
- SUPER SERVICE 5® AND OTHER PORTABLE CORDS AND CABLES

*TRADE MARK REG. U.S. PAT. OFF.

... WHEN YOU GET IT ...



CUT COSTS, SPEED JOBS WITH

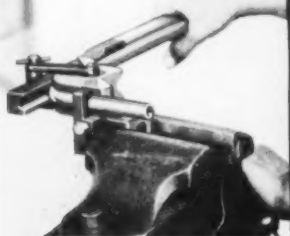


**TIMESAVING TOOLS FOR
ELECTRICAL WORK**



GREENLEE HYDRAULIC CONDUIT BENDER

Here's one of the greatest timesavers you can find today for your electrical installation jobs. Many owners of the GREENLEE Bender report labor savings from 50% to 90% . . . and the cost of many manufactured bends and fittings is eliminated. For with the GREENLEE *one man* in but a few minutes makes smooth, accurate bends in rigid conduit and pipe up to 5", thin-wall conduit, tubing and bus-bars. Compact and portable, the GREENLEE Bender can be easily and quickly moved for on-the-job bending *exactly where and when wanted*. Users say it often pays for itself on the very first job. Get complete details from your electrical distributor today.



GREENLEE HAND BENDERS FOR TUBING
For quickly making small-radius bends, up to 180°, without flattening or kinks. Saves up to 75% in time and materials on many jobs. Various models and sizes to fit your work.



GREENLEE KNOCKOUT TOOLS AND HYDRA-RAM
Making smooth, accurate knockout enlargements for 1/2" to 4" conduit is simple, quick work with GREENLEE Knockout Punches. And it's extra easy, extra speedy with the GREENLEE HYDRA-RAM punch driver.



GREENLEE HYDRAULIC PIPE PUSHERS
Save hours . . . *push pipe* under streets, railways, sidewalks, lawns and floors. Eliminate extensive ditching, tearing up, backfilling, repaving. Two models: for pipe up to 4" and larger pipe or ducts.

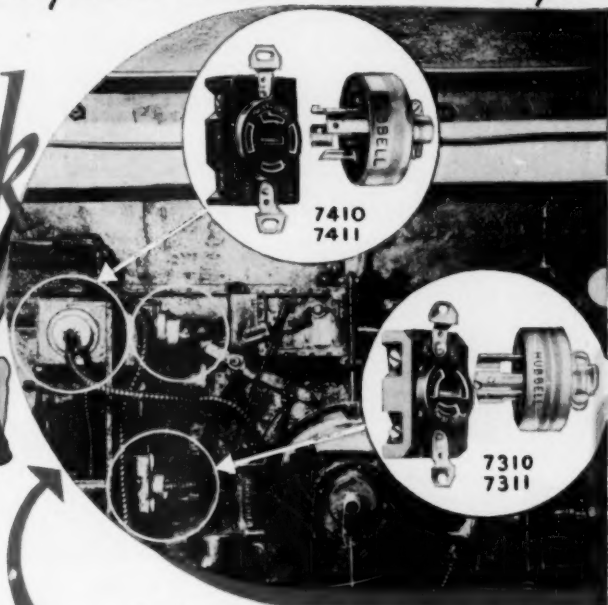
SEE YOUR ELECTRICAL DISTRIBUTOR for information on the above and these other timesaving GREENLEE tools: Cable Pullers • Joist Borers • Electricians' Auger Bits • Bell Hangers' Drills • Bit Extensions • Spiral Screw Drivers • Automatic Push Drills • and many more. Greenlee Tool Co., 1749 Columbia Avenue, Rockford, Illinois, U. S. A.



YOU KNOW IT'S RIGHT . . .

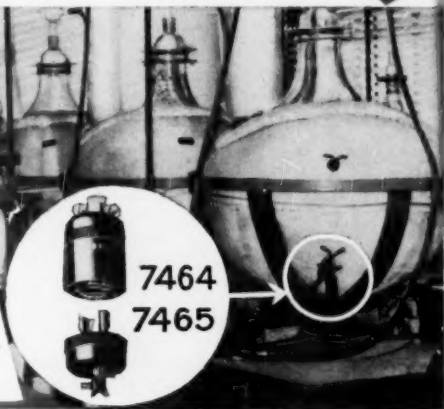
HUBBELL *Twist-Lock* DEVICES

They never disconnect accidentally!



Locked electrical connections are extremely important with industrial oil burners, and with heaters on equipment in the laboratory.

Twist-Lock Devices eliminate time-losses and annoying delays because they "stay put"—are vibration-proof — assure a lockfast electrical connection under the most trying conditions — are available polarized and grounded for safe operation!



HARVEY HUBBELL, INC.



BRIDGEPORT, CONN.

... WHEN YOU GET IT ...



IDEAL Wire-Nuts®

Patented, No. 1,933,555
(THE SOLDERLESS, TAPELESS WIRE CONNECTORS)

By the Industry's own standards

THE BEST WIRE CONNECTORS

TWISTS & THREADS

Spring insert is exactly right size and shape to twist and thread wire ends automatically. Precision built to .001" tolerance!

STRONGER

Wire ends are held in a vise-like grip that cannot pull loose or shake loose. A "Wire-Nut" joint is stronger than the wire itself!



EXACTLY RIGHT

Spring insert is proper length to allow ample clearance for wire ends.

SAFER

"Lifetime" phenolic shell is thoroughly cured. Will not crack or crumble — keeps wire ends covered. No chance for grounds or shorts.



Here's why it costs you less to use the Best!

IDEAL "Wire-Nuts" are manufactured, inspected and tested to the highest standards in the industry. The "Wire-Nut" Spring Insert is tested for wire diameter—dynamometer-tested for tensile strength—precision wound to proper conical shape—and sample checked to .001" tolerance! The "lifetime" plastic shell is submitted to a hot oil bath (300° F.) for one hour. In all, IDEAL "Wire-Nuts" must pass 9 different inspections and tests . . . For you, this *extra* care in manufacture pays off many times over. You get the best, most permanent wire joints that it is possible to make by *any* method—at an average cost of 1¢ per joint! It's no wonder that more contractors prefer IDEAL "Wire-Nuts" than any other method of making wire joints. They know from experience it costs them less to use the best—IDEAL "Wire-Nuts" . . . Be safe—be sure—for every wire joint use only IDEAL "Wire-Nuts". Every one has the name IDEAL plainly molded in the shell—always look for it!



Look for the METAL-EDGED Package

IDEAL "Wire-Nuts" are packaged in metal-edged protective boxes. The red, yellow and black package is instant identification of genuine IDEAL "Wire-Nuts". Look for it!



IDEAL INDUSTRIES, Inc.
SYCAMORE, ILLINOIS



IDEAL Wiring
Tools Cut Your
Costs on Every Job



Hand-Type Wire Stripper

Only stripper of its kind. Single light squeeze strips wire up to full 7/8 in. "Automatic" feature positively prevents crushing of wire. Just insert wire, squeeze and release. Six models—for all wire gauges from 8 to 22.

MAKE ELECTRICAL TESTING
SAFER AND EASIER



IDEAL Voltage Tester

Gives DOUBLE PROTECTION—a solenoid indicator and a neon test lamp—each independent of the other. Not an ordinary "glow" type. Actually indicates nominal line voltage on easy-to-read scale. 110 to 550 V. AC; 110 to 600 V. DC. Tests for AC or DC, grounds, fuses, etc. With or without carrying case.

CUT FISHING TIME IN HALF!



3 TOOLS

IN 1

IDEAL Fish Tape, Reel and Puller

Gives BIG pull and sure grip that makes it easy to bring tape through conduit. Keeps tape always under control, free of kinks or bends. Tape is always in reel or in the conduit—can't spring loose. Workmen avoid "live parts". Six sizes—50 to 200 feet.

FOR EASIER WIRE PULLING
—PROTECTS INSULATION

NEW . . . IDEAL

Wire Pulling Lubricant



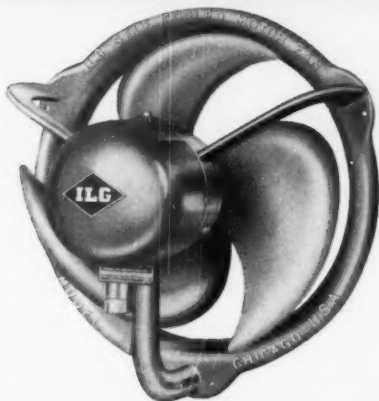
Apply by hand or brush as wire or cable is pulled into conduit. Film of lubricant dries and shrinks to a fine powder—also makes it easier to remove wire from conduit later—or add more wires to conduit. Non-corrosive, harmless. For rubber, lead or plastic covered wires. (Not for asbestos covered.)

YOU KNOW IT'S RIGHT...

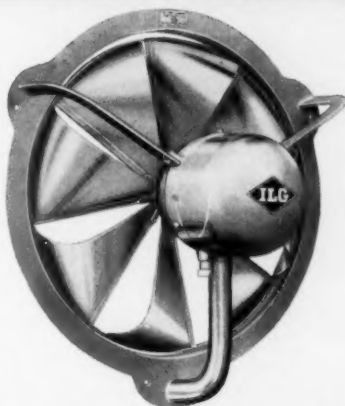
Why not buy the best?

GET FINEST QUALITY, SUPER-QUIET,
FULL CAPACITY, LONG LIFE FANS FROM

(WITH PATENTED SELF-COOLED MOTORS)



TYPE "Q" Proved in multi-thousands of installations—*extra* powerful, *extra* quiet, highly efficient—operates over long life with maximum economy, minimum maintenance. Self-Cooled Motor. Saves 5 to 10% on power costs. Models 63-483 inclusive. Catalog 149.

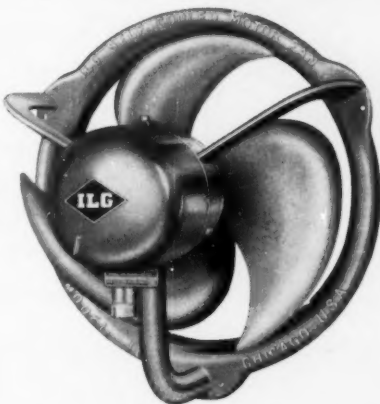


TYPE "W" Forty-four years of experience prove this design ideal for large diameter fan wheels. Over 1,000,000 now in use throughout the world. Dynamically balanced wheel. Rigid, sturdy frame. Self-Cooled Motor. 54", 60" and 72" sizes. Catalog 149.

Get latest prices and data . . . phone nearby branch office or write today!



TYPE "X" Ball bearing, explosion proof motor carries Underwriters' Laboratories label, suitable for all Class I, Group D hazardous applications. Nonferrous frame. Type "Q" wheel. 16 capacities. Bulletin 148X2.



TYPE "P" Designed to move *maximum* air volume, with *minimum* physical dimensions, for applications where low decibel sound ratings are relatively unimportant. Self-Cooled Motor. 4 sizes. Bulletin 148P1.

ILG ELECTRIC VENTILATING CO., 2877 North Crawford Avenue, Chicago, Illinois
Offices in more than 60 Principal Cities

... WHEN YOU GET IT ...



HERE'S THE FLASHLIGHT

**THAT'S FAST REPLACING
OTHER PORTABLE LIGHTS
OF ALL KINDS AMONG**

**CONTRACTORS
INDUSTRIAL USERS
MAINTENANCE MEN
RAILROADERS AND
SPORTSMEN!**



IT'S THE NEW JUSTRITE

Yellow-Flash-8

The Justrite Model 2108 is the most powerful flashlight made. Eight standard flashlight batteries give up to 9,000 candlepower . . .

a 2,500 foot beam. That's six to seven times the intensity provided by the conventional two-cell light—two to three times the intensity of the usual hand lantern—a beam power that equals or exceeds

that of hand lanterns several times larger. And, the Yellow-Flash 8 measures only eight

inches overall. It slips easily into glove compartment or tool box. Value? List price is only \$3.95 less batteries.

Special exclusive "convertible circuit" allows use of a standard 6-volt lantern battery for longer life economy light when lower intensity is satisfactory. Case is finished in high-visibility yellow, built of rust proof metal throughout. Light unit is fully adjustable and carrying handles fold flat against case.

Check your requirements today. *Get power, compactness and value all in one flashlight!*

JUSTRITE MANUFACTURING COMPANY

2063 N. Southport Ave., Dept. M-13, Chicago 14, Ill.



The Justrite line also includes these flashlights and lanterns



**No. 17-S
Approved Safety
Flashlight**



**No. 44-S
Approved Safety
Lantern**



**No. 40
Railroad Trainmen's
Lantern**



**No. 2198
Yellow-Flash
Lantern**



**No. 1958
Yellow-Flash
Headlight**



YOU KNOW IT'S RIGHT.

HAMMERS



SAWS

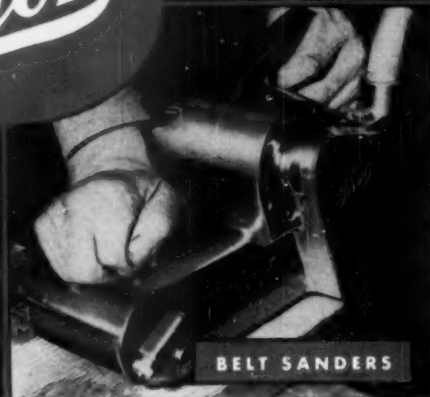


Thor

IMPACT WRENCHES



BELT SANDERS



Belt Sanders

Bench Grinders

Drills

Drill Stands

Fender Hammers

Grinders

Electric Hammers

Impact Wrenches

Nibbler

Nut Setters

Polishers

Sanders

Saws

Screw Drivers

Tappers

Valve Refacers

AN ELECTRIC TOOL TO SPEED EVERY ELECTRIC JOB!



Write for new E-2
universal electric
tool catalog.

Make mine Silver Line! Contractors throughout the country are echoing that phrase—Thor Silver Line, the only really new, modern portable electric tools, proving time and money savers on jobs everywhere. There's a size and model for every type of application—see your Thor distributor for a demonstration, or call your Thor branch.



Thor PORTABLE POWER
TOOLS

ASK FOR THE *Silver Line*

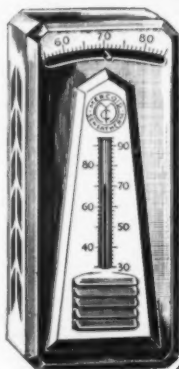
... WHEN YOU GET IT ...

via
Graybar

MERCOID AUTOMATIC CONTROLS

FOR THE HOME

AND INDUSTRY



MERCOID
Sensatherm

*The
Unexcelled
Thermostat
for
Even Room
Temperature
Control*



*Equipped with
Mercury Switches,
Assuring Longer
and Better Service*



MERCOID

AUTOMATIC CONTROLS
FOR INDUSTRIAL APPLICATIONS
REQUIRING POSITIVE CONTROL
OF PRESSURE, TEMPERATURE,

- ✧ LIQUID LEVEL ETC. ✧
- ✧ SIMPLE TO ADJUST FOR THE ✧
- ✧ SPECIFIED OPERATING RANGE ✧

✧ WRITE FOR CATALOG 700 ✧

THE MERCOID CORPORATION
4201 BELMONT AVE. CHICAGO 41, ILL.



YOU KNOW IT'S RIGHT...

Here's the NEW-Improved

Varsity



New VARSITY NV SERIES SPECIFICATIONS

Sturdy, 20 gauge steel, finished in white, high-reflection baked enamel with satin finish aluminum-grey trim. Side panels of extruded plastic. Moulded one-piece plastic "egg-crate" louver gives 40° x 40° shielding . . . louver hinged to swing from either side for easy relamping. Can be installed singly or in continuous runs. No couplers needed! . . . Slimline models feature instant-start 120, 200, 300 or 425 milli-ampere operation. Conventional 110-125 volts, 60 cycle A.C., with other voltages available.

CONSULT OUR CUSTOM-SERVICE DEPARTMENT

if you have special requirements. We will design and build lighting fixtures to your order.

A Luxury Fixture at a Budget Price!

Now the VARSITY edges into the luxury group. Yet it still is in the popular-price class. Using tubes from 48" to 96" long, this fluorescent fixture illuminates large areas at low fixture-cost and low operating cost!

LOOK AT ALL ITS FEATURES

- 1 Aligned coupling-holes
- 2 Optional reflector for increased downlight
- 3 Knockouts provided for completely flexible mounting arrangements.
- 4 Ribbed translucent curved-plastic side panels.
- 5 Upward light spill gives 40% indirect illumination
- 6 Hinged louver to swing from either side for easy relamping and servicing.
- 7 2, 3 or 4 40-watt tubes or Slimline tubes 48" to 96"
- 8 Injection-moulded plastic louver with 40° x 40° shielding angle
- 9 High reflection baked-enamel reflector
- 10 No couplers required for continuous row installation

Sold and installed only by the better electrical wholesalers and contractors



Leader

America's No. 1 Lighting Equipment Manufacturer

LEADER ELECTRIC COMPANY • 3500 NORTH KEDZIE AVENUE • CHICAGO 18, ILLINOIS
Leader Electric - Western • 800 One Hundredth Avenue • Oakland 2, California
Campbell-Leader, Ltd. • Brantford, Ontario, Canada

... WHEN YOU GET IT ...

via
Graybar

This Salesroom is selling **both day and night**



... at Koster-Swope, Louisville, Kentucky

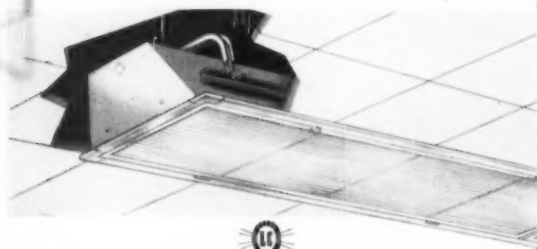
Architect: Joseph H. Kalbrook
Electrical Engineer: E. R. Ronald & Associates.
Electrical Contractor: Robert E. Barry Electric Co.
Litecontrol Fixtures: No. 5138 — 3 lamp; No. 5128 — 2 lamp; No. BF-H15 — recessed lens box.
Watts per fixture: No. 5138 — 281 w.; No. 5128 — 184 w.; No. BF-H15 — 150 w.
Ceiling height: 15 feet.
Spacing: 8 feet on centers.
Average footcandles: 42 in service.
* © HOLOPHANE CO., INC.

AFTER DARK, the Litecontrol fixtures in this smart automobile showroom come into their own — illuminating the cars on display in a manner to attract passersby and build sales long after regular business hours. Yet, during the day, they are completely unobtrusive and blend smoothly with the ceiling. There is nothing to distract a buyer's eye from the smart lines and charm of the cars. If you have a problem in lighting showrooms — or any difficult-to-handle-spot — your nearest Litecontrol representative will be happy to assist you in any way.

The LITECONTROL No. 5100 Fixture ...

is a recessed, Slimline fixture designed to give exceptionally efficient light distribution. Lens may be either Holophane CONTROLENS® or diffusing glass panels held in two hinged frames. Merely loosening the self-retaining catches gives instant and easy access to the inside for servicing.

| Catalog Number | Number of Lamps | Housing Length | Housing Width | Housing Height | Trim Length | Trim Width | Approx. Ship. Wt. |
|----------------|---|----------------|---------------|----------------|-------------|------------|-------------------|
| 5128 | 2-75W T-12 | 96" | 11 1/2" | 7 1/4" | 98 1/8" | 14" | 80 lbs. |
| 5138 | 3-75W T-12 | 96" | 11 1/2" | 7 1/4" | 98 1/8" | 14" | 92 lbs. |
| 5100-3 | End cap for individual units or continuous runs | | | | | | 2 lbs. |
| 5100-6 | Suspension strap — 2 per unit | | | | | | 3 lbs. |



LITECONTROL
Fixtures
KEEP UPKEEP DOWN

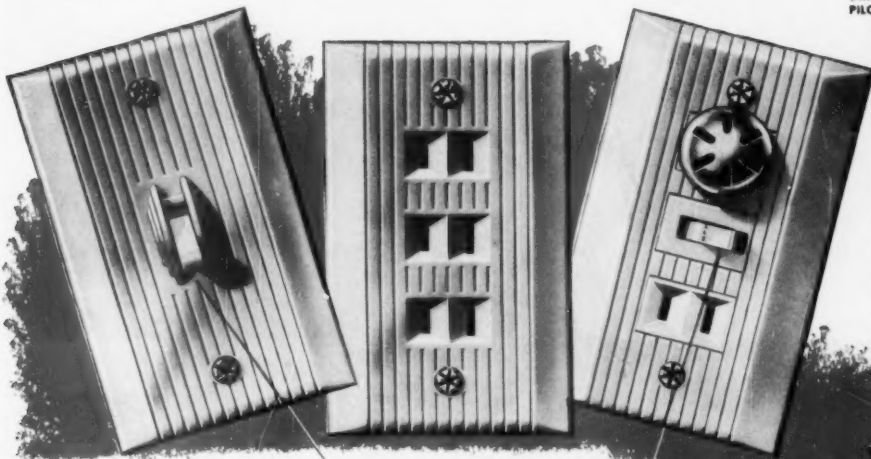
LITECONTROL CORPORATION
36 PLEASANT STREET, WATERTOWN 72, MASSACHUSETTS

DESIGNERS, ENGINEERS AND MANUFACTURERS OF FLUORESCENT LIGHTING EQUIPMENT DISTRIBUTED ONLY THROUGH ACCREDITED WHOLESALERS



YOU KNOW IT'S RIGHT..

Monowatt *Combines* devices and plates for *fast, dependable* wiring



Cat. No. 1321—"T" Rated Single Pole Switch & Plate. **Cat. No. 1323**—"T" Rated Three Way Switch & Plate. In Brown and in Ivory. 5A-250V; 10A-125V. Meet Federal Specifications W-S-896 except for technicality in Para. E-12[®].

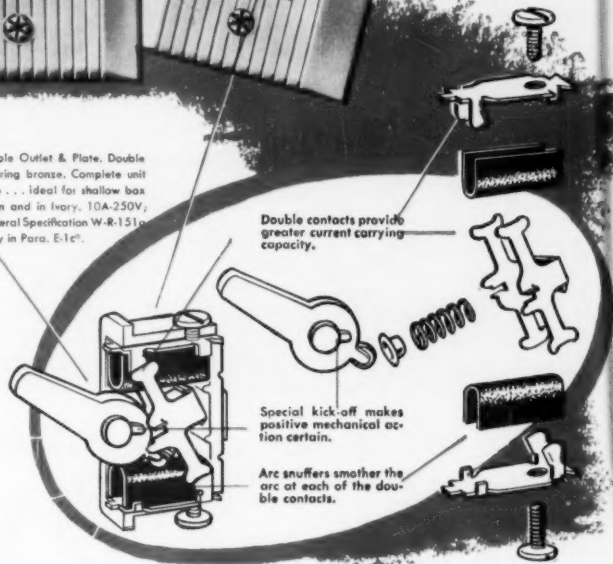
Cat. No. 1323—Triple Outlet & Plate. Double contacts of heavy spring bronze. Complete unit is less than $\frac{1}{8}$ " deep... ideal for shallow box installations. In Brown and in Ivory. 10A-250V; 15A-125V. Meet Federal Specification W-R-151 except for technicality in Para. E-12[®].

[®] Requires a metal mounting strap. These devices are factory assembled on the plate to make a one-piece easy-to-install unit.

COST LESS TO BUY. You save about one-fourth the cost of separate devices of equal quality... you get three outlets at less than the cost of two.

COST LESS TO INSTALL. (1) Just two screws mount the complete unit. (2) Combining plate with device makes flush mounting automatic... eliminates adjustments. (3) Oval screw holes give ample leeway for squaring. (4) Mounting screws already in position, ready to be screwed into outlet box.

GIVE A BETTER JOB. Smart and modern in appearance, these specification grade devices mean fewer call-backs, longer years of reliable service.



SWITCH, OUTLET and PILOT LIGHT COMBINATIONS

Cat. No. 4046—Pilot Light, Single Pole Switch, Outlet & Plate (illus.)

Cat. No. 4031—Single Pole Switch, Outlet & Plate.

Cat. No. 4024—Two Single Pole Switches & Plate.

Cat. No. 4025—Single Pole Switch, Three Way Switch & Plate.

Cat. No. 4026—Single Pole Switch, Pilot Light & Plate.

Cat. No. 4041—One Single Pole Switch, Two Outlets & Plate.

Switches "T" rated, 5A-250V; 10A-125V. Outlets, 10A-250V; 15A-125V. Pilot Lights (6 watt lamp), 75W-125V. Meet Federal Specifications W-S-893, except for technicality in Para E-12[®].



MONOWATT INCORPORATED • A GENERAL ELECTRIC AFFILIATE, PROVIDENCE 7, R. I.

... WHEN YOU GET IT...

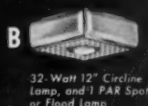


ONLY module LIGHTING CUSTOM-FITS

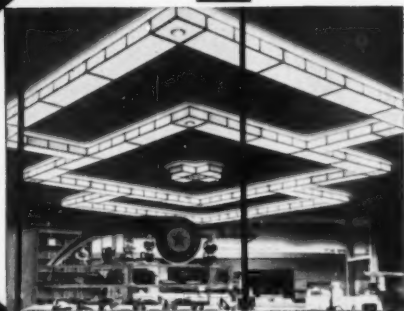
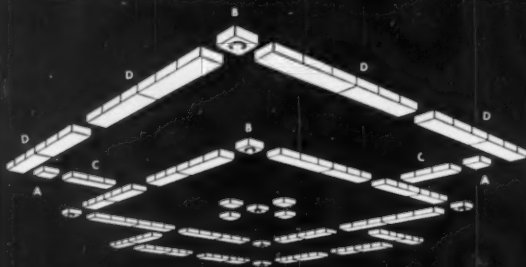
REG. U.S. PAT. OFFICE

*this MAGIC
low-cost way*

THESE 4 MODULES ARE THE
"BUILDING BLOCKS" OF LIGHT



THEY FIT TOGETHER LIKE THIS... FOR LIGHTING MAGIC LIKE THIS



50,000 different patterns possible—20% more light!

Nothing in lighting compares with MODULE! Nothing in lighting matches MODULE's custom-fitting flexibility and economical high-efficiency.

It's amazing! With just 4 simple, low cost "building blocks of light," MITCHELL MODULE offers *unlimited* custom-fitting lighting patterns to fit any commercial interior. MODULE's exclusive plastic louver passes 20% MORE LIGHT. Simple fitting together of units (mechanically and electrically) permits low cost rearrangement of patterns at any time to suit changing needs. MODULE mixes all light sources smoothly in one harmonious, handsome system—puts the light exactly where it's needed. No ordinary fixtures can match MODULE—the only lighting that custom-fits with standard low-cost units.

Only MITCHELL makes MODULE

There's nothing in lighting like MODULE. It custom-fits and "grows" with every lighting need; it delivers more light; it stays beautiful, new; it costs no more than ordinary fixtures. If you haven't all the MODULE facts, write today for full descriptive details.

MITCHELL MANUFACTURING COMPANY

2525 N. Clybourn Ave. • Chicago 14, Illinois
In Canada: Mitchell Mfg. Co., Ltd., 11-25 Davies Ave., Toronto

YOU SELL module INSTALLATIONS WHEN YOU TELL THIS SELLING STORY



YOU KNOW IT'S RIGHT.

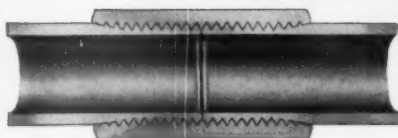
**IT'S FORTIFIED FOR
LIFE-TIME PROTECTION**



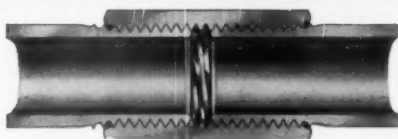
**SPECIFY
NATIONAL ELECTRIC**

SHERARDUCT

To Keep Wiring Safe, PERMANENTLY



SHERARDUCT COUPLING—All surfaces and threads are Sherardized. Accurately undercut threads permit completely closed joints—no raw threads exposed—no gaps to interfere with the easy fishing of wires.



ORDINARY COUPLING—Raw threads meet raw threads—accelerates rust—weakens joint. Threads exposed in gaps trap wire ends and make the fishing of wires difficult.

FULL WEIGHT . . .

THREADED . . .

RIGID STEEL CONDUIT

When the job calls for a conduit that must withstand the test of time—there's only one *Sherarduct*! Sherarduct is a rigid steel conduit that is permanently rust-proof. The zinc protective coating alloyed to the steel by the special Sherardizing process will not crack or peel. Sherarduct is heavy-walled, threaded, smooth inside to assure easy fishing.

**National Electric
PRODUCTS CORPORATION**

1301 CHAMBER OF COMMERCE BLDG., PITTSBURGH 19, PA.



via
Graybar

WHEN YOU GET IT...



IT WON'T BREAK if it's a new **O.Z.** **ALL-BAKELITE BUSHING!**

**BOUNCE
IT**

Bounce an O. Z. All-Bakelite Insulating Bushing hard, on a concrete floor — it rebounds good as new. Add to its superior strength* these extra features and you've got a bushing that's best by any test!

- Smooth rounded edges completely protect wire insulation during pulling and when in service.
- Clean, deep threads let you spin-on the bushing with a twist of the wrist.
- Ribbed outer surface provides a grip for slippery hands and permits tapping with a screw-driver.

O. Z.'s New All-Bakelite Insulating Bushings are fully approved by Underwriters' Laboratories, meet all requirements of the National Electric Code.

Try a few, bounce 'em, treat 'em rough and you'll be convinced there are no all-Bakelite bushings better suited to the job . . . none so economical to use as O. Z.'s.

Available in sizes from 1/2 inch to 6 inches, cost no more than ordinary Bakelite bushings. Samples on request.

*56% stronger over all than all other leading all-Bakelite bushings actually tested by an independent laboratory.



CONDUIT FITTINGS • CABLE TERMINATORS
CAST IRON BOXES • GROUNDING DEVICES
SOLDERLESS CONNECTORS • POWER CONNECTORS



Buy O. Z. and you'll see
why Engineers say,
"They're OK if they're O.Z."

O.Z.

**ELECTRICAL
MANUFACTURING
COMPANY, INC.**

262 BOND STREET • BROOKLYN 2, N. Y.

4899



YOU KNOW IT'S RIGHT.

"Here are 8 Reasons why I specify ORANGEBURG"

— says the Utility Engineer



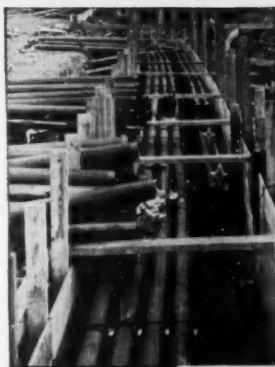
The man in the picture symbolizes the many utility engineers who always specify Orangeburg® Conduit. And here are eight of the numerous reasons why he feels that way.

- Will not corrode. Lasts indefinitely.
- Impermeable wall and tight joints prevent corrosive ground waters from entering.
- Lays faster and at lower cost than any other type of conduit.
- Low coefficient of friction keeps pulling tensions on cable to minimum.
- Protects cable sheath from abrasion when pulled in—also from wear during cable movement due to alternate expansion and contraction with changing loads.
- Resists acids, alkalis, grease, oil.
- Light, easy to handle and tool on the job.
- Tough, resilient—will not crack or break when properly handled.

A Money-Maker for the Contractor

Contractors agree that Orangeburg lays faster and at lower cost than any other conduit. It is light,—easy to handle and tool. Its tough, time-defying material and tight joints make it the ideal underground raceway for the permanent protection of cables. Orangeburg's complete line of bends, angle couplings, bend sections, union connections, bell ends and other standard fittings help prevent costly installation delays.

By saving time and work, Orangeburg Fibre Conduit *makes* money for the contractor from the start to the finish of the installation. No wonder Orangeburg is leader and first choice in every city and state. Orangeburg Manufacturing Co., Inc., Orangeburg, N. Y.



**ORANGEBURG
STANDARD**

... installed with concrete encasement. The preferred conduit for banks of three or more ducts.

**ORANGEBURG
NOCRETE**

... installed without concrete encasement. Its extra heavy wall makes NOCRETE ideal for many single or double duct runs.

ORANGEBURG
FIBRE CONDUIT

STANDARD Installed with Concrete

NOCRETE Installed without Concrete

Graybar
ELECTRIC COMPANY

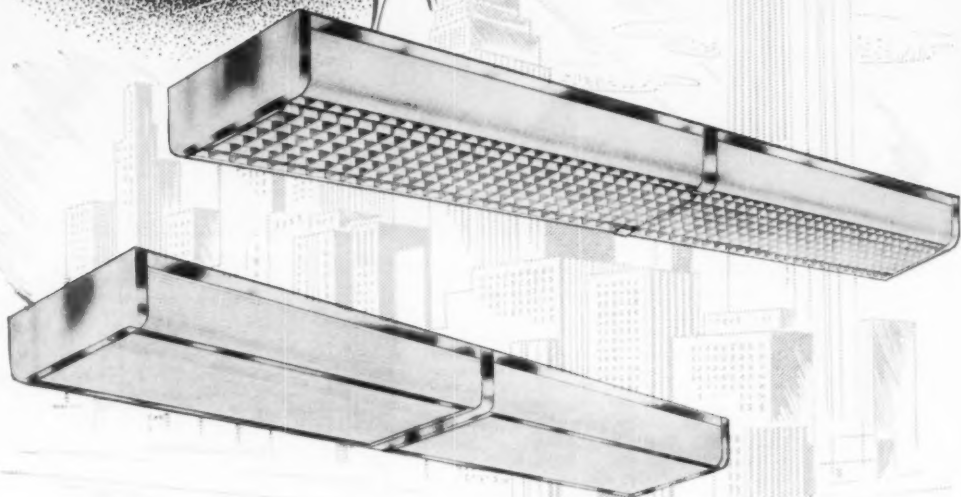
"FOR TOMORROW'S BETTERMENTS"

... WHEN YOU GET IT ...



"Light Magic"

FOR WORKING WONDERS in PLANNED LIGHTING!



TWO NEW 48" and 96" SLIMLINE LUMINAIRES

THE "WASHINGTON" SLIMLINE LUMINAIRE features an egg-crate louver bottom and Skytex satinol glass side-panels. It is made in 2, 3 and 4 lamp models. Standard operation is 425-MA with T-12 lamps. Bridge-truss construction assures a unit which "hugs" the ceiling when it is surface mounted.

THE "HARRISON" SLIMLINE LUMINAIRE, in 2, 3 or 4 lamp models. Gracefully curved side-panels, flat bottom-panels of Alba-Lite glass distinguish this modern slimline luminaire. Companion incandescent units are designed especially for use with the "Harrison" and other Presidential Fluorescent Luminaires.

The flexibility of Pittsburgh Permalector Lighting Equipment is a modern miracle of design and construction.

For example—Pittsburgh Permalector Slimline Luminaires are available in 48" and 96" lengths. They may be surface or pendant mounted, individually or end-to-end. When used with companion incandescent down-lights, they can be installed to form squares, rectangles, "T's", cross-overs, checkerboards and other patterns.

Such flexibility allows you full creative expression and makes possible "custom designed" lighting results with economical standard equipment.

Write today for more information on these versatile units.

PITTSBURGH REFLECTOR COMPANY

404 OLIVER BUILDING • PITTSBURGH 22, PENNSYLVANIA

MANUFACTURERS OF FLUORESCENT & INCANDESCENT LIGHTING EQUIPMENT

Permalector Lighting Engineers in All Principal Cities



YOU KNOW IT'S RIGHT...

PLANNING AERIAL CIRCUITS?...

CIRCUITS TO BE BURIED DIRECTLY IN EARTH?...

CIRCUITS TO BE INSTALLED IN DUCTS OR CONDUIT?



• Here's one cable for all three services
THAT SAVES and SAVES and SAVES!!

SAVES ON FIRST COST. Simplex-ANHYDREX Cables save you money at the outset for their moisture-resisting Anhydrex insulation and their tough neoprene jacket combine to eliminate the need for costly metallic sheaths or other protective coverings. They save you the expense of buying and stocking a variety of cables for different applications as they are designed for use — as is — in open air, in the earth, and in ducts or conduit. They are Type RR Cables. They have CAA approval as underground cables for airport lighting under Specification L-824. They are suited for use as underground service entrance cables and when requested bear Underwriters' Type USE labels. You'll find them ideal, too, for street and park lighting, as Drive-In-Theatre Cable, and in signal and control circuits.

SAVES ON INSTALLATION. The comparatively light weight and small diameter of ANHYDREX Cables, their flexibility, and their smooth jacket surface result in worthwhile savings on installation. Crews work faster, more efficiently, for they find ANHYDREX Cables easy to handle, easy to splice, joint and terminate. When pulling the cable through ducts no oil or grease lubricants are needed. Marks, letters, or figures may be molded onto the jacket to provide instant identification of circuits.

SAVES ON MAINTENANCE. Simplex-ANHYDREX Cables promise long, dependable service, free of untimely failures and costly maintenance. Their Anhydrex insulation has excellent dielectric properties and provides steadfast resistance to water and moisture. The neoprene jacket is resistant to abrasion, soil acids and alkalis, oil, flame, sunlight and weathering. Having no metallic coverings, the cables are not subject to electrolysis nor harmed by vibration, stray or secondary currents.

SIMPLEX-ANHYDREX

SIMPLEX WIRE & CABLE CO.

79 SIDNEY STREET

Cambridge 39, Massachusetts

... WHEN YOU GET IT ...



It's easier to work

the "TUG-FREE" way



Tug-Free wire pulling is a direct result of ELECTRUNITE E.M.T.'s knurled inside surface, which reduces the area of contact, between wires and the inner raceway wall.



YOU KNOW IT'S RIGHT..

with **ELECTRUNITE** **E. M. T.**

There's a lot less elbow grease and grunt when you pull wire through the *knurled* inside surface of Republic's ELECTRUNITE E.M.T. Actual tests measuring pound-pull show up to 30% less effort needed! This big energy saving feature is *only one of many ways* ELECTRUNITE E.M.T. makes a wiring job easier. Look at these other money-saving features...

Inch-Marking—easy-to-read inch and foot marks on popular sizes of ELECTRUNITE E.M.T. give you "at-a-glance" measurements for bending and cutting lengths.

Light weight—less than half that of heavy conduit. It's no strain to carry or install lengths of strong, rigid ELECTRUNITE.

No thread cutting, no turning in—a few turns of the wrench or heavy pliers and the slip-on compression fittings give strong, tight, seepage-proof joints.

Bending is a breeze, too—the easy-to-use, one-piece ELECTRUNITE Bender and the handy Inch-Marking system make bend, stub or offset forming easy.

There are more, many, many more good reasons why ELECTRUNITE E.M.T. is a prime favorite with journeymen on the job and with contractors who must meet building schedules. Why not get the complete story on this *modern* way of running wiring... contact your nearest ELECTRUNITE Distributor for the low down on the low cost way... the ELECTRUNITE E.M.T. way. Or write today to:

REPUBLIC STEEL CORPORATION
STEEL AND TUBES DIVISION • CLEVELAND 8, OHIO
Export Department: Chrysler Building, New York 17, N. Y.



This knurled inside surface is an effort-saving feature you will find in 1/2", 3/4" and 1" sizes of Republic Steel's famous ELECTRUNITE E.M.T. It's one more reason why ELECTRUNITE E.M.T. is the preferred raceway with contractor and maintenance man alike.



Republic
ELECTRUNITE E.M.T.

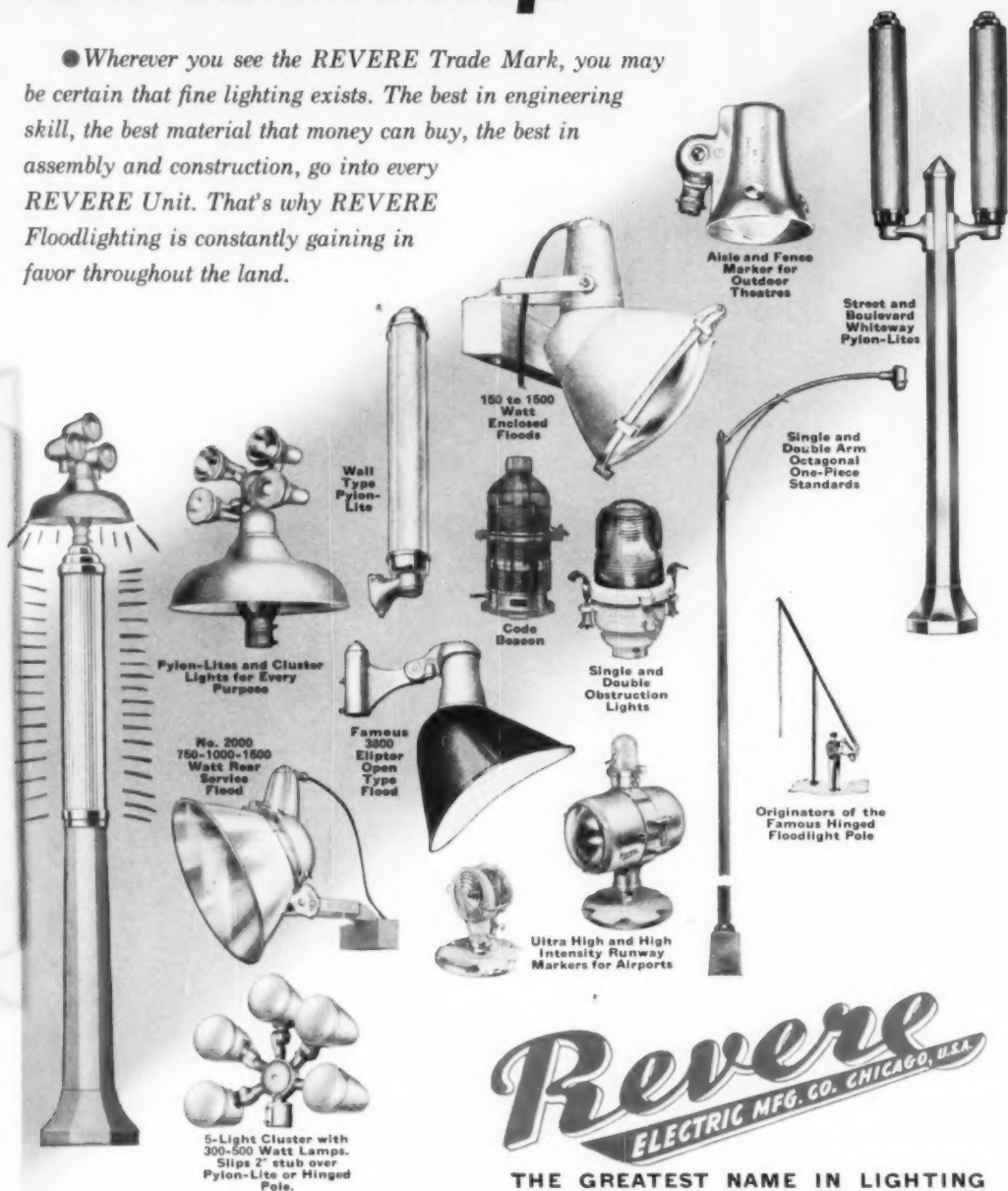
LIGHTWEIGHT THREADLESS RIGID STEEL RACEWAY

... WHEN YOU GET IT...



Leadership

●Wherever you see the REVERE Trade Mark, you may be certain that fine lighting exists. The best in engineering skill, the best material that money can buy, the best in assembly and construction, go into every REVERE Unit. That's why REVERE Floodlighting is constantly gaining in favor throughout the land.



Revere
ELECTRIC MFG. CO. CHICAGO, U.S.A.

THE GREATEST NAME IN LIGHTING

6017 BROADWAY CHICAGO 40, ILLINOIS

WE COVER THE FIELD WITH A COMPLETE QUALITY LINE OF . . . SERVICE STATION • AIRPORT • SPORTS • STREET • OUTDOOR THEATRE • MARINE AND INDUSTRIAL LIGHTING EQUIPMENT



YOU KNOW IT'S RIGHT . . .

which do you want?



we make them all

Yes, Spang makes them all. No matter what type of rigid conduit is called for on the job, you can get it from your friendly Central Conduit Distributor.

He handles three types of full weight, rigid steel conduit: "CENLACO" has a hot dipped, galvanized finish both inside and out . . . "CENTRAL WHITE" has an electro-galvanized finish on the outside and black enameled on the inside . . . "CENTRAL BLACK" has a black enameled finish both inside and out. And he handles "CENTRAL EMT", a light-weight steel conduit that's electro-galvanized on the outside and durably lacquered on the inside. All of them are manufactured to Spang's quality specifications. And all of them meet Underwriters' Laboratories requirements and are approved by the National Electrical Code.

Your friendly Central Conduit Distributor also handles complete lines of other electrical products. And when you call him, you'll learn why he takes such pride in the service that he gives to his customers.

SPANG-CHALFANT

Division of The National Supply Company

GENERAL SALES OFFICE: GRANT BLDG., PITTSBURGH, PA.

District Offices and Sales Representatives in Principal Cities



CENLACO a hot dipped galvanized and lacquered finish, inside and out.

CENTRAL BLACK permanent, baked-on black enamel finish, inside and out.

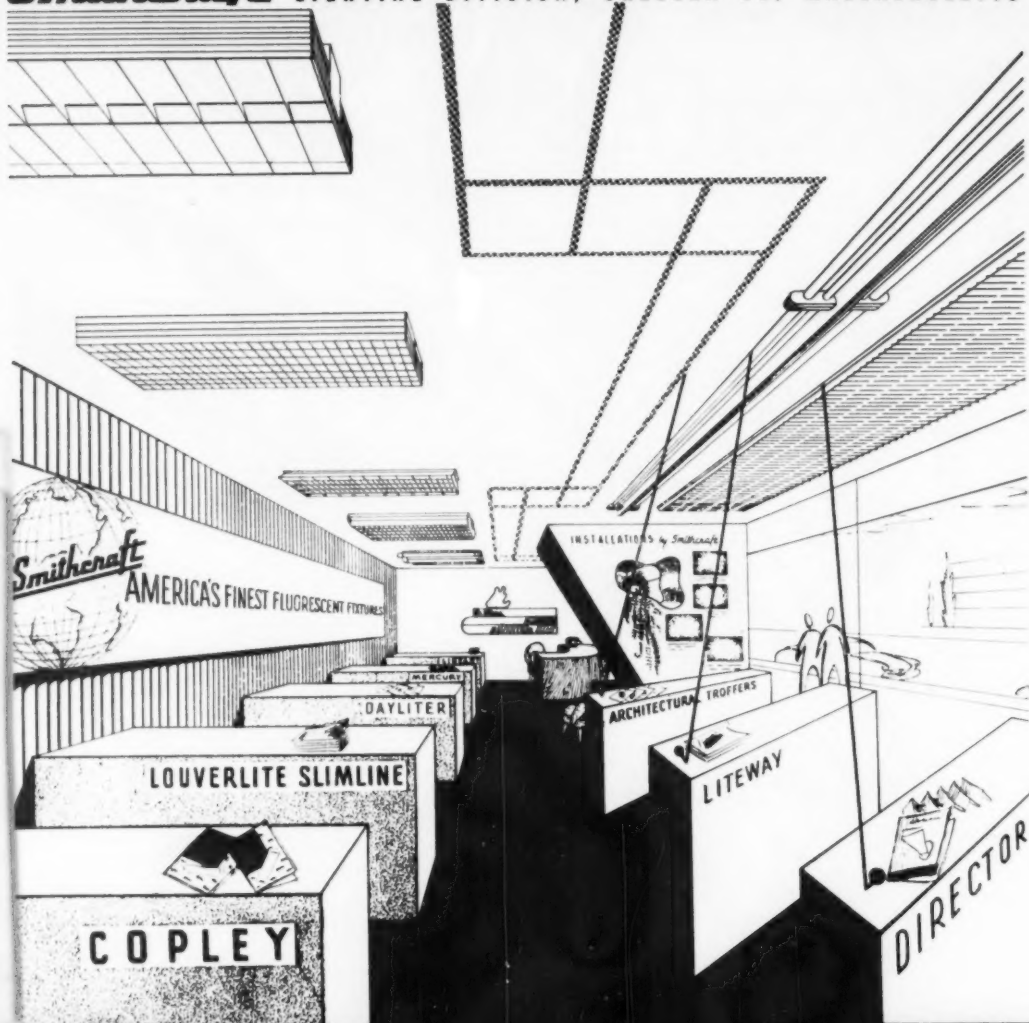
CENTRAL WHITE electro-galvanized outside and black enameled inside.

EMT—Light-weight electro-galvanized outside and durably lacquered inside.

... WHEN YOU GET IT ...



Smithcraft LIGHTING DIVISION, CHELSEA 50, MASSACHUSETTS



There is a Smithcraft fluorescent fixture for virtually any type of installation... more than 40 outstanding lighting fixtures, incorporating exclusive and important features... more than 500 variations for Bi-Pin and Slimline lamps. And every Smithcraft fixture is quality-designed and manufactured... guaranteed to provide a long-term lighting investment. This means that the purchaser can select the *right* fixture for a specific location, with the assurance of optimum lighting performance from the entire Smithcraft line.

The new Smithcraft Price Catalog is now available. It illustrates and describes all Smithcraft commercial and industrial fixtures... an informative and helpful "working" tool. Write for your copy today!



YOU KNOW IT'S RIGHT...

FARADAY

HOLTZER-CABOT

STANLEY & PATTERSON

*Three great names with a single purpose
... Better Signal Systems!*



UNI-PACT GIVES QUICK CHANGE WITH 17 DIFFERENT UNITS

Regardless of constantly changing noise levels in different parts of the plant, UNI-PACT has 17 interchangeable signal units, fitting one adapter plate, that give complete mastery of audible signaling. Installation is easy! First, wire to the back of the dead front adapter plate which fits standard 4 inch outlet box, wiremold or conduit fitting. Secure adapter plate to box. Plug in UNI-PACT signal and secure with locking screws. Illustrated to the left are the many UNI-PACT Signal units that give a "tailor-made" signal system.

**HOSPITAL NURSES'
CALL SYSTEMS**

CLOCK SYSTEMS

PAGING SYSTEMS

FIRE ALARM



STATION

Faraday Coded
Closed Circuit,
Four Round, Fire
Alarm Station.
Semi-flush, break
type. Mechanism can
be Presignal and Gen-
eral Alarm or General Alarm
only.



CONTROL PANEL

Faraday Fire
Alarm Control
Panel, in surface
or flush, steel wall
type cabinet with
hinged door, glass
insert for observ-
ing meters. Panel
provides single
supervision of
system.

Spertt Faraday Inc
ADRIAN, MICHIGAN

BELLS • BUZZERS • HORNS • CHIMES • VISUAL AND AUDIBLE PAGING DEVICES AND SYSTEMS

... WHEN YOU GET IT ...



SQUARE D's *New* SAFETY SWITCHES

*Types A, C and D



Backed by 40 years'

DESIGN LEADERSHIP

The remarkable superiority of this new switch line is reflected in these TYPE A design and operating features:

MODERN STYLING is both functional and attractive.

COMPACTNESS obtained without sacrifice of wiring convenience.

FULL COVER INTERLOCK has attachment that locks switch "ON" or "OFF" with 1, 2, 3 or 4 padlocks of nearly any size or shape.

SIMPLE MECHANISM—quick make-and-break action—no dead center.

SILVER-PLATED current-carrying parts.

EXPOSED BLADES permit visual

checks of switch operation.

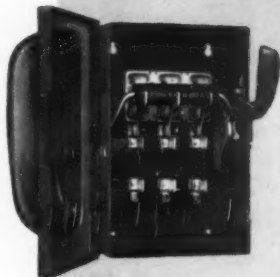
DEAD-FRONT line terminals are protected by hinged arc chamber cover.

MAGNETIC ARC PLATE adds to unusually high rupturing capacity.

POSITIVE PRESSURE jaws and fuse clips, steel reinforced, silver-plated.

NON-TRACKING insulation used in base. Melamine insulating cross-bar.

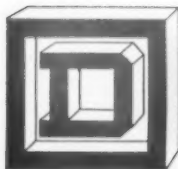
REMOVABLE PRESSURE CONNECTORS permit substitution of solder lugs, where preferred.



*Types C and D similar to Type A in appearance—differ in construction details

SAFETY SWITCHES and other Square D Products

are distributed by **GRAYBAR**



SQUARE D COMPANY

DETROIT

MILWAUKEE

LOS ANGELES

SQUARE D COMPANY CANADA LTD., TORONTO • SQUARE D de MEXICO, S.A., MEXICO CITY, D.F.



YOU KNOW IT'S RIGHT..

**An Announcement of Importance
to The Electrical Industry**

UNDERWRITERS' APPROVE

**TRIANGLE
"DUAL-RATED" WIRE**

for

**RH OR RW
APPLICATIONS**

IT'S "DUAL-RATED" One wire — two purposes
Reduce inventory headaches —
specify "Dual-Rated" wire.

In a move of prime importance to the electrical industry, Underwriters' Laboratories, Inc., has issued an approval for Triangle's "Dual-Rated" Wire as Type RH or Type RW. This means that "Dual-Rated" wire is suitable for use as Type RH at 75°C. in dry locations or Type RW at 60°C. in wet locations.

"Dual-Rated", available in sizes #14 to 1,000,000 CM, is a superior quality general purpose wire, having the following outstanding properties: extreme moisture resistance, excellent heat resistance, exceptionally long life. In sizes #14 through #6, "Dual-Rated" incorporates Triangle's famous Glazon cover. When buying wire for hot or moist locations, reduce your inventory headaches — specify Triangle's "Dual-Rated" wire.

In the long run—you'll save
—and get it faster—from a
Triangle Distributor.

TRIANGLE CONDUIT & CABLE CO., INC.

1900 JERSEY AVENUE

PLANTS: NEW BRUNSWICK, N. J.

NEW BRUNSWICK, NEW JERSEY

MOUNDSVILLE, W. VA.



GLAZON BUILDING WIRE • BARE WIRE • ARMORED CABLE • GLAZON NON-METALLIC
SHEATHED CABLE • SERVICE ENTRANCE, SERVICE DROP, VARNISHED CAMBRIC BRAIDED OR
LEADED, TRIOPRENE TRENCH, POWER AND PARKWAY CABLES • RIGID CONDUIT HOT-DIPPED
GALVANIZED • ELECTRIC METALLIC THIN WALL CONDUIT • FLEXIBLE STEEL CONDUIT



... WHEN YOU GET IT ...



VERSATILE LIGHTING-JOB TAILORED

STEBERLITES - USE THEM SINGLY OR IN CLUSTERS



Steberlite Lamp Holder S-300 for medium base Par-38 and R-40 lamps. S-350 for Mogul base R-40 lamps.

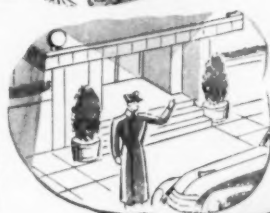


All Steberlites listed by Underwriters' Laboratories, Inc.

Complete, compact, weatherproof Lamp Holders that save labor and wiring costs. Mounted singly or in clusters up to 5 they provide for general or supplementary spot and floodlighting for used car lots, parking lots, service stations, building entrances, displays, and around farms, homes, parks, lawns, flower gardens, etc.

A small inventory of Steberlite basic units does a big sales and profit job. If a copy of Bulletin 120-50 is not at hand, write today.

By use of Adapter Box S-301, clusters up to 5 can be assembled as one unit and fitted to 1½" or 2" pipe or for connection to conduit.



STEBER UTILITES

For Par-38 and R-40 Reflector Sealed Beam Lamps
Listed by Underwriters' Laboratories, Inc.

Nearly four million Steber Utilites have been installed—good evidence of the tremendous market for these all-round Lamp Holders.

No. 2 is for indoor or outdoor service, with U bracket for universal adjustment and round base for surface mounting. Free Point of Sale 3-color display stand in every standard package. Utilites are a complete line of Lamp Holders, including swivel units and color equipment.



No. 2 Utilite for spot or floodlighting, indoors or out.



No. 8 Swivel Utilite.



No. 7 Swivel Utilite, heavy base has protective rubber bumpers—also mounting holes.

STEBER

FLOODLIGHTS

Fast Moving Types and Sizes That Meet 90% of All Needs



Series 57



Series 1400



Series 4000

In addition to the wide use of Steber Floodlights around industrial and commercial areas, parking lots, shipping areas, etc., Steber Floodlights are being more widely used around homes for greater outdoor living as well as for protection. Open types No. 57 and 59 (100-300 watts) and enclosed types No. 572 and 592 (100-200 watts) are particularly suited.

For larger areas the No. 1600 enclosed type with spun aluminum reflector provides high intensity lighting for billboards, outdoor displays, etc. Uses 300-500 watt Mogul base lamps.

For Sports Lighting the newly introduced 4000 Series is available. These are enclosed types with all standard mounting brackets. Write for Bulletin 128-50.

All Steber floodlights are listed by Underwriters' Laboratories, Inc.

STEBER MANUFACTURING CO.

Dept. 99,
Broadview (Maywood P. O.), Illinois



YOU KNOW IT'S RIGHT..

Steel City Electric Company Offers You MORE

than...

A few types of Switch Boxes in greatest demand

A few ordinary Outlet Boxes and Covers

A few easy to make Fittings

The Line Includes

All Types of Switch Boxes

ALL Types of Outlet Boxes and Covers

... and, Conduit Fittings that meet practically every wiring requirement

... and every item is backed by a reputable concern with almost 50 years of manufacturing experience.

IN ELECTRICAL BOXES and FITTINGS

Steel City Leads

In Meeting Contractor's Needs



STEEL CITY ELECTRIC COMPANY

1207 COLUMBUS AVENUE, PITTSBURGH, (12) PENNA

... WHEN YOU GET IT...





Something to crow about

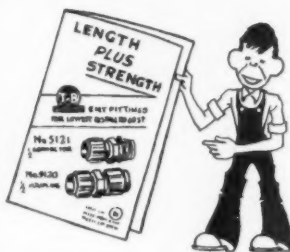
—we have it
in **STEEL**



LISTED BY
UNDERWRITERS'
LABORATORIES



$\frac{1}{2}$ "
RAINTIGHT CONNECTOR
FOR E. M. T.



Write for a sample and a folder
describing all sizes $\frac{3}{8}$ " to 2".

- FORMED STEEL BODIES.....for strength and uniformity
- FORMED STEEL GLANDS.....for strength and clean cut threading
- EXTRA WIDE STEEL LIPS.....for long support, great rigidity
- DOUBLE THICK STEEL BUSHING.....for velvet smooth protection of insulation
- HARDENED STEEL LOCKNUT.....for certain holding and positive grounding

This remarkable improvement in connectors holds when only finger tight. The electrician doesn't need three hands nor two wrenches. He tightens the gland nut only. The novel two-in-one action of the connector tightens the locknut on the box automatically as the gland tightens on the tube.

Cat. No. 5121 is the $\frac{1}{2}$ " Steel Connector for E. M. T.

Cat. No. 5120 is the companion piece, the $\frac{1}{2}$ " all-steel Coupling for E. M. T.

With their bright Tabolite finish these fittings are ideal for use in the weather or buried in concrete. Their unusual length, compared with ordinary connectors and couplings, insures unusually rigid E. M. T.

It's the Installed Cost That Counts



THE THOMAS & BETTS CO.

ELIZABETH 1,

INCORPORATED

NEW JERSEY

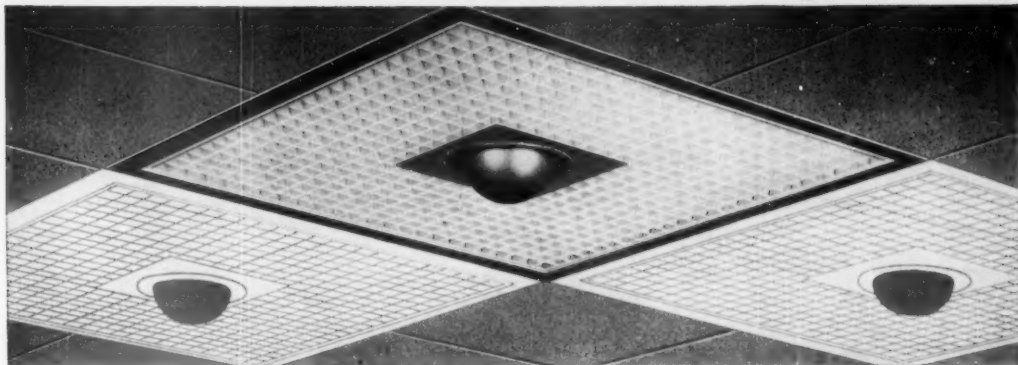


T&B PRODUCTS SOLD AND SERVICED THROUGH THE T&B DISTRIBUTOR



YOU KNOW IT'S RIGHT...

Now-a new kind of Lighting

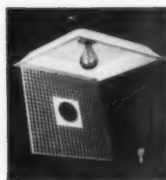


...with all the advantages of incandescent
Plus the modern appearance of fluorescent! **SILVRAY**

The SKYLIKE system brings you a new concept of lighting . . . makes it possible for you to offer your commercial customers something dramatically different, better—and lower-cost! In addition to superior-quality illumination for seeing and for selling—and other features of strong appeal to users—SKYLIKE has the contractor advantages of simple wiring, light weight and fast installation, and complete freedom from service call-backs.

In fact, this new adaptation of silvered-bowl incandescent lighting provides a combination of important practical advantages not found in any other lighting system:

1. High initial and maintained light output.
2. Softly diffused shadows.
3. Low brightness and 90° shielding.
4. No flickering, blinking, or hum.
5. Warm color—most desired by merchandising experts.
6. Instant starting.
7. Variable lamp size—150- to 500-watt.
8. No light loss from darkened walls or ceilings.



*Patent pending

EASY TO CLEAN—The 87% reflection factor of SKYLIKE's enamelled ceiling is easily maintained by occasional cleaning with a damp cloth. Relamping can be done from the floor.



ACCENT LIGHTING or directional lighting is readily accomplished with SKYLIKE by the substitution of a semi-silvered-bowl lamp and a simple accessory, as shown above.

9. Floor-service relamping—no ladders or scaffolds.

10. Hermetically sealed silver reflecting surface.

WIDE FREEDOM OF USE

In addition to all its technical advantages, SKYLIKE is modern, handsome, and versatile in application. Units fit 24" x 24" ceiling tiles, fully or partially recessed, or may be surface-mounted—in rows or patterns. With a simple accessory and a semi-silvered-bowl lamp, SKYLIKE is converted for directional or accent lighting.

AMAZINGLY LOW-COST!

Because it is so simple—simple in construction; simple in wiring; free of ballasts, starters, and accessories—SKYLIKE is low in cost (1/2 to 1/3 the cost of equipment delivering comparable results!). Its light weight makes for easy handling, fast installation, and lower-cost supporting construction. There's no transformer or starter maintenance. SKYLIKE can be relamped from the floor (no step-ladder!) with a lamp changer.

Skylike *



Send coupon
for complete data

Graybar Electric Co., Inc.
Graybar Building,
420 Lexington Ave.
New York 17, New York



Please rush me details of Silvray
SKYLIKE lighting.

Name _____ Title _____

Firm _____

Address _____

City _____ Zone _____ State _____

5045 EC

... WHEN YOU GET IT ...





"Quick-install-ability"

saves initial cost

LTG FLEX-A-POWER busways are pre-fabricated housings which are easily coupled in any arrangement and in runs of any required length. Time for installing is much less than for wiring and conduit.

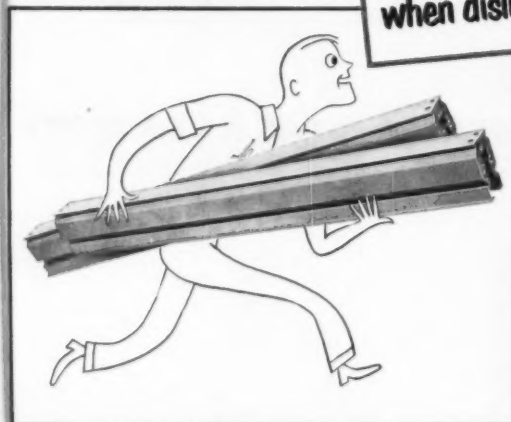


"Plug-in-ability"

saves time relocating machines

Take-off plugs or trolley can be inserted anywhere (no drop-out section needed for trolley). You can add or relocate loads without rewiring expense and without long extensions.

**Save money
these 3 ways
when distributing power**



"Take-apart-ability"

saves material expense

Whenever a major relocation of outlets is required, the entire FLEX-A-POWER system can be dismantled, removed to another location and re-installed with practically 100% re-use of materials.



Sealed Power Corp.

saves with **Flex-a-Power**

LTG FLEX-A-POWER, one of six forms of FLEX-A-POWER for various services from main breakers to individual loads, is designed for light-duty lighting, small tools, appliances. Write for Bulletin TEC-3, THE TRUMBULL ELECTRIC MANUFACTURING COMPANY, Plainville, Conn.

TRUMBULL  ELECTRIC



TRUMBULL'S TRAIN OF NEW PRODUCTS



YOU KNOW IT'S RIGHT..

Designed for Contractors

by Wakefield



The Pre-Installed Strap

**... vital first step in
easy one-man installation**

Run a chalk line along the ceiling, measure off your intervals, attach all the straps in the line with toggle or anchor bolts—then carry up your units one at a time and slip the flared ends of the stems into the bayonet slot of the straps. As simple as that. One man can do it. Saves time, saves labor, gives your customer an economical job. And each successive step is just as easy—all the way through to final installation... as we'll show you in further ads.

Wide-awake contractors don't say, "Hang the expense!" They say, "Hang Wakefield!"

The F. W. Wakefield Brass Company • Vermilion, Ohio



.. WHEN YOU GET IT...



TO KEEP

Ahead of Trouble

Self-shielded, easily read, Weston Model 901 Portable Instruments tolerate wide temperature fluctuations, stay accurate to $\frac{1}{2}$ of 1%.



For accurate circuit analysis, use the ultra-sensitive Weston Model 785 Industrial Circuit Tester. It provides 28 AC and DC voltage, current and resistance ranges.



All AC and DC requirements are met by the extensive Weston line of Panel and Switchboard Instruments.

WESTON

Instruments

When the warning flags are flying it pays to be prepared, at sea or ashore. To keep ahead of trouble on your electrical equipment, rely on Weston Instruments to warn of approaching trouble . . . to isolate circuit faults . . . to assure trustworthy repairs. Weston Electrical Instrument Corporation, 672 Frelinghuysen Avenue, Newark 5, New Jersey.



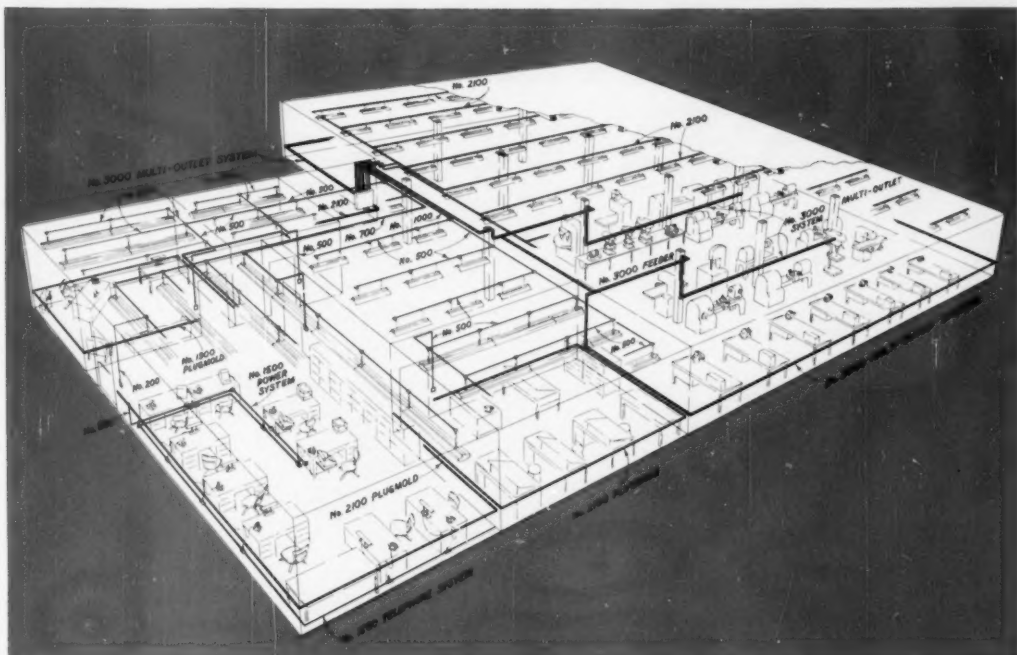
Measuring voltage and current on insulated or bare conductors is quick and easy with the Weston Model 633 AC Clamp Volt-Ammeter.



YOU KNOW IT'S RIGHT.

ON ANY JOB..

LARGE or **SMALL** **SIMPLE** or **COMPLEX**



SEE HOW EASILY YOU CAN

WIREMOLD *it*

As this layout shows, just about any kind of a wiring problem can be solved by the man who "knows his Wiremold."

Whether it is original installation, modernization, relocation or extension, the nine basic Wiremold Systems and their well designed fittings enable you to do the job fast and do it right . . . with no muss, no fuss and complete satisfaction to the customer.

Write for your Wiremold Wiring Guide if you do not already count this book "the handiest tool in your kit."

THE WIREMOLD COMPANY
HARTFORD 10, CONNECTICUT

The dependable Guide

to **ADEQUATE WIRING**



.. WHEN YOU GET IT..



FOR SAFETY'S SAKE . . . USE CONDUIT (*Full Weight Rigid Steel*)

You never go wrong on rigid steel conduit

THE heavy steel walls of rigid conduit afford sure protection to wiring. Encased in steel, cables are safely shielded during construction and for the entire life of the building. When installation of floors is long delayed, rigid conduit protects the

system, free from harm by wheelbarrows and trucks of careless workmen, safe from thoughtless acts of intruders, undamaged by moisture or fire or dust. Check with your distributor for the availability of Youngstown Buckeye or Youngstown EMT.



Youngstown

BUCKEYE CONDUIT

THE YOUNGSTOWN SHEET AND TUBE COMPANY

Manufacturers of Carbon, Alloy and Incoloy Steel

General Offices — Youngstown 1, Ohio

Export Office - 500 Fifth Avenue, New York

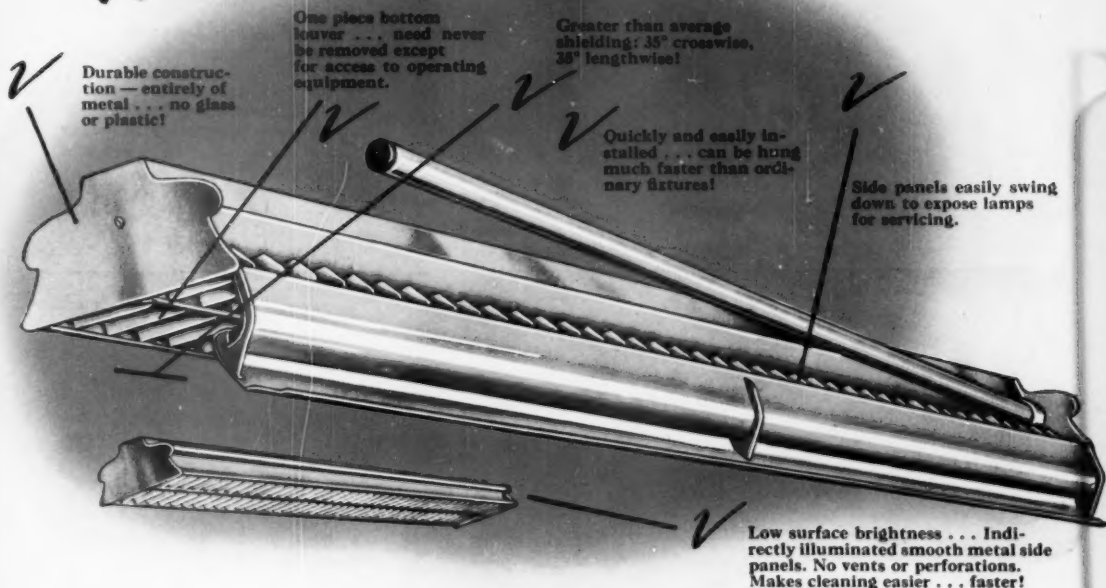
CONDUIT - PIPE AND TUBULAR PRODUCTS - BARS - RODS - COLD FINISHED CARBON AND ALLOY BARS - SHEETS - PLATES - WIRE - ELECTROLYTIC TIN PLATE - COKE TIN PLATE - TIE PLATES AND SPIKES.



YOU KNOW IT'S RIGHT..



This unit has everything!



Here it is — the perfect fixture for Commercial Lighting! This new Wheeler O. C. Slimline unit is the answer for illuminating Offices, Schoolrooms, Stores, Drafting Rooms, Hospitals and Public Buildings. Attractive, economical and efficient.

Made for use with two 75 watt, 96" T12 Slimline lamps and two 40 watt, 48" T12 single pin lamps. Write Wheeler Reflector Company, 275 Congress St., Boston 10, Mass. . . Also New York, N. Y. Representatives in principal cities.



**OCULAR
COMFORT**

Wheeler REFLECTORS

Distributed Exclusively
Through Electrical Wholesalers

WHEN YOU GET IT...



GraybaR

**YOUR SUPPLY POINT
for 100,000
electrical items**

*For facts
call our nearest
office*



ALABAMA
Birmingham

ARIZONA
Phoenix

ARKANSAS
Little Rock

CALIFORNIA
Fresno
Long Beach
Los Angeles
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Sacramento
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COLORADO
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VIRGINIA
Norfolk
Richmond
Roanoke

WASHINGTON
Seattle
Spokane
Tacoma

WEST VIRGINIA
Charleston

WISCONSIN
Milwaukee

*You know it's right
when you get it via...*

GraybaR

Motor Shops

Unit Cuts, Crimps And Rolls Insulation

With approximately two-thirds of their repair work in the transformer field, Dowzer Electric Machinery Works, Inc., at Mt. Vernon, Ill., uses a substantial amount of insulating paper. Since paper width depends upon the size of the transformer repaired, Dowzer secures its insulating paper in 36-inch wide rolls and cuts, crimps and re-rolls for stock according to requirements.

To facilitate this operation and increase the efficiency of the stockroom system, shop foreman H. Ray Wilson developed a hand-operated machine that does all three operations simultaneously. It takes only about ten minutes to run off a 3½-pound roll of 3½-inch crimped insulation, including time for setting cutting wheel, paper guides, creasing disks, crimping guides and rollers and adjusting the re-roll drum.

The basic frame of the unit is made of 2-inch steel channel; supports the crimping table and re-roll drum 36 inches off the floor; incorporates a heavy frame to support the large paper rolls and cutting mechanism. The heavy rolls of 36-inch paper are placed on a ball bearing spindle to reduce frictional resistance to the re-rolling operation.

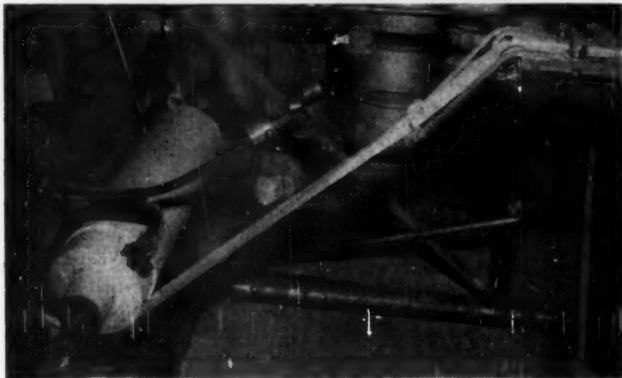
Once the large roll is in place, the cutting arm is adjusted to the desired band width (illustration shows a 4½-inch cut for a 3½-in. crimp). Heavy weights press the cutting wheel into the paper as it is pulled off the roll. Normally, three or four nails are driven into the paper near one end of the roll to prevent slippage during the cutting and crimping operation.

The paper is fed through an overhanging guide onto the crimping table; then through the creasing disks, crimping guides and rollers by turning a hand knob on the creasing roller. The paper is then pulled over and attached to the re-roll drum. After that the process is continued by merely turning the 12-inch lever arm on the re-roll drum shaft. As this drum rotates, the paper is cut, creased, crimped and rewound into rolls of the desired width. A ½-inch crimp is produced on each side of the paper as it runs through the machine.

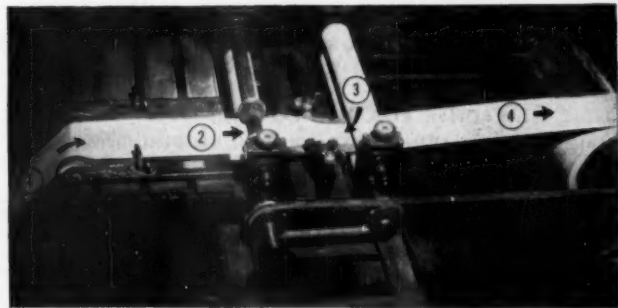
As the width of the original roll decreases, the crimping table can be moved to the left or right for alignment with the new cut. Pressure on



IN ONE OPERATION, a roll of 3½-inch "crimp" can be produced from a 36-inch wide roll of insulating paper in the transformer repair department of Dowzer Electric Machinery Works. Designer-operator H. Ray Wilson.



PAPER IS CUT to desired width by adjustable, heavily weighted cutting arm. Paper is fed through overhanging guides to crimping table.



ON CRIMPING TABLE, paper rides through (1) feeder guides; (2) creasing disks and roller; (3) crimping guides and rollers; then (4) onto re-roll drum.

Genuine Joe Says:

when new
capacitors are
needed...
replace with
genuine
Wagner
Capacitors



Play Safe...

Always use genuine Wagner Motor Starting Capacitors for replacements. You are assured of the same high quality as the original capacitor and you don't risk your reputation with a capacitor that is "just as good" in everything but performance.

The capacitor model number, stamped on Wagner Motor nameplates, furnishes an easy and accurate method of selecting the *right* capacitor every time.

Write for Wagner's new Fast-Moving Parts Bulletin, MU-122, and for Motor Parts Catalog MU-40. They will help you in your work.

WAGNER ELECTRIC CORPORATION

6413 PLYMOUTH AVENUE • ST. LOUIS 14, MISSOURI, U. S. A.



MOTORS • BEARINGS • STANDARD ROTORS
BRUSHES • CAPACITORS • COMMUTATORS

**450 AUTHORIZED SERVICE STATIONS
OR PARTS DISTRIBUTORS**

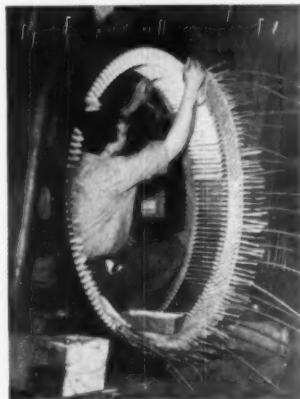
the creasing disks and roll and the crimping rolls (ordinary washing machine wringer rolls) can be adjusted by knurled set screws. Both the paper-width and crimping guides have thumb-screw adjustments; can accommodate paper up to 11-inch width (before crimp). The re-roll drum can be quickly dislodged to remove the new roll of crimped paper. Wing-nut bolts hold the drum shaft bearings in saddles of the supporting brackets.

Although the unit is now hand operated, it can be easily motorized. This change is now under consideration by the designer.

200 Hp Rewind Job Calls For Teamwork

Rewinding a 20-hp. Crocker Wheeler synchronous motor is not an everyday job for the Reserve Electric Company of Cleveland, Ohio, yet such a job is taken in stride and is rushed through the various repair stages without disrupting the pattern of normal shop routines. The answer lies in teamwork, with the rotor and stator handled simultaneously by separate groups of electrical repair men, and with all departments cooperating to avoid delays between steps.

Coils for the 450-rpm., 3-phase, 60-cycle stator were wound, stretched into shape, dipped and baked in the company's electric oven while slots were cleaned and slot insulation was cut and formed for insertion into frame grooves. As the 144 coils were prepared they were placed in position, wedged, connected and silver soldered. Testing was completed, the motor was reassembled and shipped back to a satisfied customer.



INSERTING COILS in 200-hp. Crocker Wheeler stator is Don Fowler, shop foreman for Reserve Electric Company.



FITTING MASTERPIECE by Killark

THE FIRST FITTING IN MALLEABLE DIE-CAST* ALUMALLOY

Tested and accepted *in the field*, this Killark (6-Ways-Better) fitting stands out as a new major achievement in design and construction. Die-cast under 10,000 lbs. pressure . . . made of new Alumalloy which combines strength and malleability with the recognized advantages of aluminum . . . it climaxes seven years of concentrated metallurgical research, yet costs no more than ordinary fittings.

First with ALUMALLOY FIXTURES, too

• A COMPLETE, ALL-PURPOSE LINE

Vapor and Explosion-Proof Lights and Fittings . . . Service Fittings . . . Couplings and Connectors . . . Conduit Bodies . . . Flush Switch Fittings.

*Pat. Pending



Killark invites your comparison.

60% LIGHTER THAN IRON—easier to handle.

NON-CORROSIBLE and weatherproof *clear through* . . . resists chemical corrosion—will not rust!

MALLEABLE—enough “give” to withstand shock and strain far beyond job demands.

SMOOTH INSIDE AND OUT—satin-like finish prevents wire skinning, insuring insulation protection.

CLEAN-CUT THREADS make work simple . . . assure precise fitting and longer, trouble-free service.

NON-SPARKING—Alumalloy is completely safe . . . eliminates possibility of fire and explosion.

Write for full information.

ELECTRIC MANUFACTURING COMPANY

Vandeventer and Easton Aves.

St. Louis 13, Missouri

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170-TON VERTICAL LIFT BRIDGE at Buffalo, N. Y., has control wiring safely insulated and sealed against moisture with "SCOTCH" No. 33 Electrical Tape.

Plastic tape saves \$350 on Buffalo bridge wiring

Problem: how to stop circuit leaks on the \$350 feeders of a vertical lift bridge control system. **Solution:** Buffalo, N. Y., engineer applies "SCOTCH" No. 33 Electrical Tape.

W. R. Green, Buffalo, N. Y., Engineering Dept., writes—"To avoid replacing the 4100 volt feeders, we insulated them with varnished cambric, Phenolic resin, rubber and friction tape. This application lasted only about a month. Then we heard about "SCOTCH" No. 33 Electrical Tape. This tape has shown absolute evidence of accomplishing the work—even in snow and ice."

You can solve your insulating problem with one of the many "SCOTCH" Electrical Tapes. See your jobber, or write Dept. EC 115 today.



LEADS from pothead to oil switch sealed from humid, contaminated river atmosphere with plastic backed "SCOTCH" No. 33 Electrical Tape.



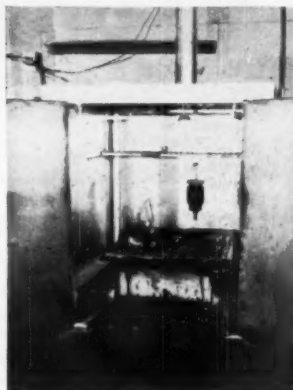
Made in U.S.A. by MINNESOTA MINING & MFG. CO., St. Paul 6, Minn., also makers of other "Scotch" Brand Pressure-Sensitive Tapes, "Scotch" Sound Recording Tape, "Underseal" Rubberized Coating, "Scotchlite" Reflective Sneeting, "Safety-Walk" Non-Slip Surfacing, "3M" Abrasives, "3M" Adhesives, General Export: Durez Abrasives Corp., New Rochelle, N. Y. In Canada: Canadian Durez Abrasives Ltd., Brantford, Ontario.

Shop Oven Features Many Conveniences

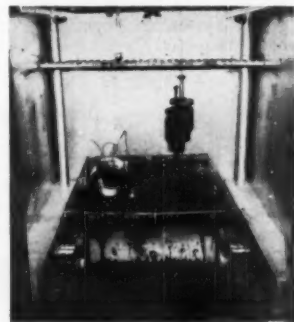
The bake oven at French-Gerleman Electric Company, St. Louis, motor service organization, was custom-built to meet the specific requirements of that shop. To incorporate the economies of natural gas in that region, it was designed as a gas-fired unit.

The floor-type oven is five feet square and 5½-feet deep; is constructed of a double sheet-metal wall with 1½-inches of insulation between; is built around an angle-iron frame; accommodates a special dolly with a platform grille and removable drip pan; will take up to a 75 hp., 1800 rpm. stator.

Heat is furnished by two long natural gas burners mounted at the base of the two side walls. Each burner consists of a length of ½-inch diameter pipe with two parallel rows of holes drilled in the top. A pilot light is cen-



CUSTOM-BUILT bake oven operates on natural gas; is constructed of sheet metal walls with insulation between; has special dolly and facilities for suspending all types of equipment.

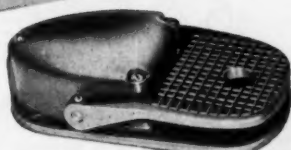


OVEN INTERIOR showing burner enclosures at base, special dolly in between, shelf and hangers for small equipment. Infra-red lamp provides illumination.

NEW HEAVY-DUTY FOOT SWITCH



**CLASS 9002
TYPE AW**



Type AW Foot Switch without guard—
for applications not involving hazard to
operator.



Self-contained contact mechanisms are
easily wired and readily replaced.

- ✓ Streamlined to match modern machine styling.
- ✓ Heavy cast case, gasketed for oil-tight applications.
- ✓ Compact design—hugs floor—won't tip.
- ✓ Wide pedal, operable from three directions but protected against accidental contact or falling objects.
- ✓ Short stroke and slight angle of pedal eliminate ankle fatigue.
- ✓ Few moving parts insure long mechanical life.
- ✓ Self-contained contact mechanisms are easily wired and readily replaced.
- ✓ Snap action contacts, rated 600 volts pilot duty, A.C. or D.C.
- ✓ Available, with or without pedal guard, in several types.

| DESCRIPTION | TYPES | |
|--|---------------|------------|
| | Without Guard | With Guard |
| Single pole, double throw | AW 1 | AW 2 |
| Double pole, double throw | AW 3 | AW 4 |
| Two stage, each stage single pole double throw | AW 5 | AW 6 |

Write for BULLETIN 9002 Type AW
Address Square D Company, 4041 N. Richards St., Milwaukee 12, Wis.

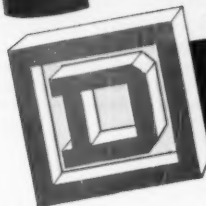
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"Okay, Fatso — where did you hide the dough you saved by using cheap materials?"

P.S. Let him go, Slim. You can't save money by using inferior wiring devices — they cost more, in the long run. But you really can get more for your money by using easy-to-install P&S devices: you save time on the job, win more customer satisfaction — and build your own reputation as a man who knows his business.



more wiring room with P&S box cover switches

These new box cover switches give you more wiring room — flush back leaves entire box free for splices, locknuts and bushings . . . streamlined, one-piece, sturdy bakelite switch housing acts as box cover . . . handle in protected position, operates horizontally . . . terminals ample for No. 12 wire . . . rated 125 v, 10 amps; 250 v, 5 amps . . . carry Underwriters' approval and meet or exceed all Federal and R.E.A. specifications. Available in single pole and three-



P & S No. 1141 (4-inch)

way, non-T-rated, T-rated and Oil Burner, these dependable P & S switches have positive kick-off, arc-snuffers, pre-loaded contacts. Modern, compact, smart appearing, they have exceptional current-carrying capacity. Remember, they give you more wiring room. And as with all easy-to-install P & S devices, they are your best buy when you want smooth, dependable, long-life operation. Get them from your P & S distributor today! Available for 3 1/4 or 4" Boxes.

PASS & SEYMOUR, Inc.

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Syracuse 9, N. Y.

Maker of the famous P&S-Despard Line



tered in each burner. A sheet metal trim over fire-brick enclosures conceals the heating plant. Vent pipes connected to a flue remove combustion gases.

A variety of electrical items find their way into a shop bake oven. Equipment may range from small solenoids and coils to large stators and armatures. For small parts, a 16-inch deep shelf (removable) has been installed on angle-iron "rails" near the rear of the oven. Smaller armatures and parts can be suspended from rods and miniature mono-rails at the rear and sides of the oven roof. Large, heavy equipment is placed on the special dolly which can be easily rolled into the oven enclosure.

Oven illumination is provided by an infra-red lamp—the only lamp that withstands the oven heat for any length of time.

Normally the oven, which is manually controlled, is operated at a temperature of 275° F. Automatic control can be added without any difficulty when desired.

All-Purpose Outdoor Hoist

What was once the mast of a railroad semaphore is now the supporting member of an all-purpose outdoor swinging hoist at the motor service shop of the F & H Electric Motor Company in Dallas, Texas. It is free-standing, not braced by the building structure; supports a pin-hinged hoist beam (10-ft. length of 8-in. I-beam)



OUTDOOR HOIST is fashioned from an I-beam swinging arm and an old railroad semaphore mast. Unit is free-standing and is used for loading and unloading trucks as well as an outdoor burn-out oven.

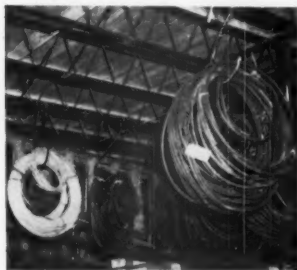
12 feet above the ground, has an overall height of 22 feet.

The base of the mast is a heavy 6-in. diameter pipe set in a 5-ft. cube of concrete. The top section of the mast, supporting the hoist beam, is of smaller diameter. Three 1/2-in. diameter steel rods act as stabilizers; extend from the concrete base to the tip of the mast; are extended about 18 inches from the mast at the half-way point by welded brackets; are tightened by eyebolt turn-buckles at the base.

Located near the shop truck entrance, the hoist can be used for loading or unloading trucks as well as a proposed outdoor burn-out oven to be constructed adjacent to the building wall. Although a one-ton chain hoist is now being used, the swinging arm beam has a four-ton capacity.

Floor Joists Are Storage Aids

Coils of wire and cable as well as ladders and other equipment are safely stored above the floor, protected against damage, on the second floor of the Reserve Electric Company's shop in Cleveland, Ohio. Large S-hooks are used as the suspending media, with the upper sweeps placed around the lower flanges of the ceiling bar joists. These joists, with flanges formed by right-angles placed back-to-back and the bar-formed webs consisting of continuous trusses, are ideal for this purpose. For S-hooks can be positioned wherever required along the lengths of the joists, and auxiliary supports can be quickly positioned by placing lengths of pipe between the joists at right angles to the flanges. The truss formation of the web prevents bars from shifting or rolling under a load and, by utilizing these hangers, equipment is kept off the floor. This eliminates the possibility of wire or ladders being damaged by heavy objects falling or being placed on top of them.



S-HOOKS and bar joists are combined to store cables and construction equipment safely above the floor in the storage areas of Cleveland's Reserve Electric Company.



with **ACCURATE** FRICTION AND RUBBER **TAPES**



SINGLE ROLL
CARTONS



SINGLE ROLLS
CELLOPHANE WRAPPED



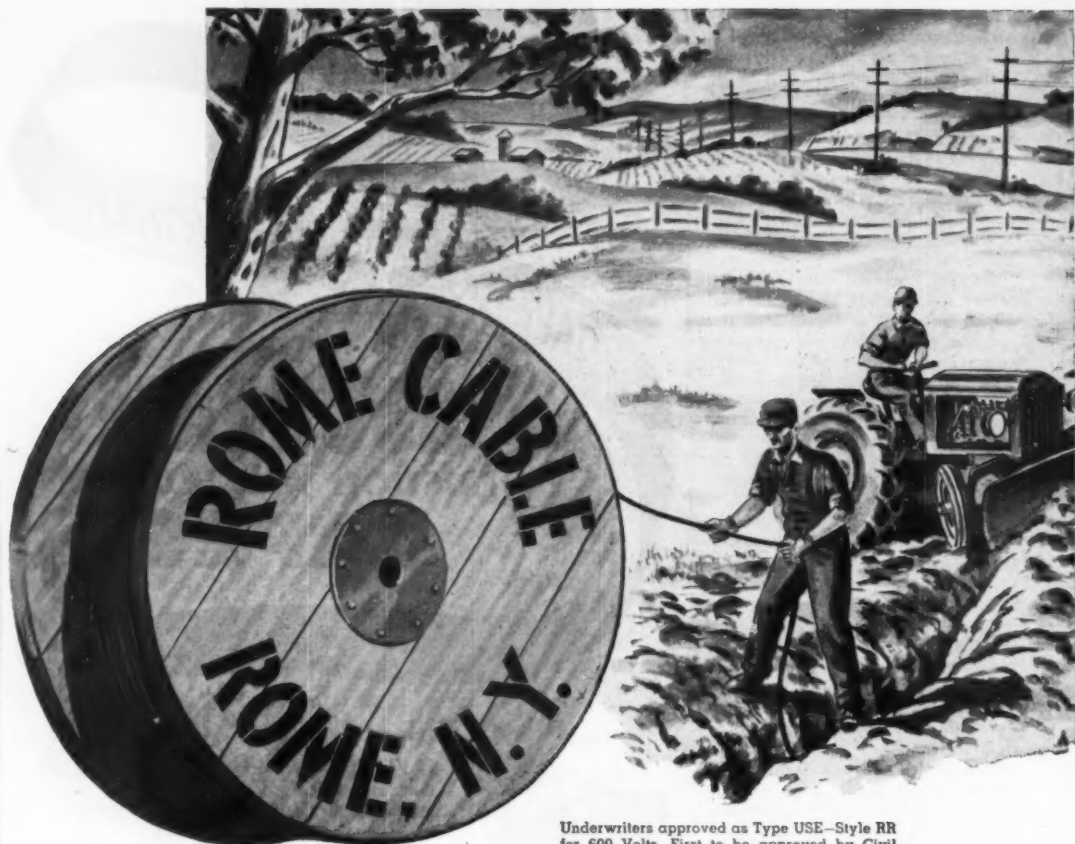
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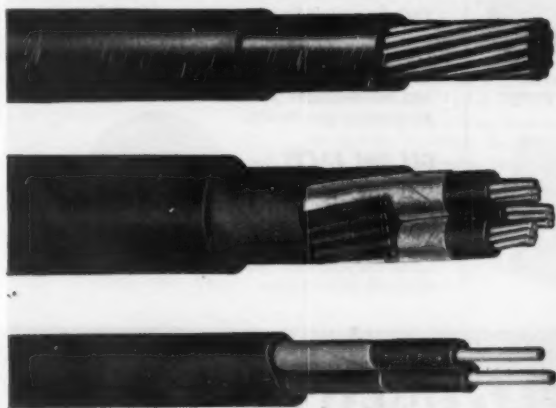
GET THE FACTS on Accurate Tapes today! This new catalog contains complete information on all Accurate Tapes. Illustrated, it includes specifications, roll lengths and packaging. To obtain your copy, just call or write the Accurate Manufacturing Company, Griffield, New Jersey.

ACCURATE TAPE





Underwriters approved as Type USE-Style RR for 600 Volts. First to be approved by Civil Aeronautics Administration as Type A insulation for airport wiring under Specification L-824.



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BUILD YOUR UNDERGROUND WIRING SALES WITH

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ALL-PURPOSE POWER CABLES

RoBarn—For Farm and General Purpose Wiring



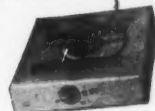
Here is a "hot" sales item. Underwriters approved as Non-Metallic Sheathed Cable, RoBarn is the safe barn wiring material. Neoprene insulated and sheathed, it will not mold, rot, or oxidize. It is completely resistant to chemical fumes and is unaffected by the extreme temperatures and humidity of livestock buildings.

Developed primarily for the farm, RoBarn is ideally suited to any general purpose wiring where comparable hazards exist. Write for descriptive folder.

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Special Wholesalers Packaged Weatherproof Wire



Here is a special 500 foot carton package of Weatherproof for handy contractor use. If you are not pushing this item, you're missing a fast seller. Originated by Rome for small outdoor jobs, this convenient package eliminates waste and cuts costs. Available in sizes 4 to 14 AWG, soft and medium hard.

Originated by Rome for small outdoor jobs, this convenient package eliminates waste and cuts costs. Available in sizes 4 to 14 AWG, soft and medium hard.

There's a tremendous market for RoMarine-RoPrene... the modern, all-purpose power distribution cable. Farm electrification, outdoor theaters, airports, industrial and commercial modernization, as well as, residential services all offer you an opportunity to increase your wire sales with RoMarine-RoPrene. You can recommend RoMarine-RoPrene for these jobs with confidence that you are selling your customers the *right* cable and *best* cable for the job.

Versatile in application, RoMarine-RoPrene is one cable you can offer for direct earth burial, installation in air, in conduit, or for circuits combining all three. The RoMarine insulation affords resistance to heat and moisture. The RoPrene (Neoprene) sheath is highly resistant to oils, acids, alkalies, corrosive fumes, flame and abrasion. Its fast growing popularity proves its dependability.

RoMarine-RoPrene is less costly than lead sheathed cables... easier to handle, tape and splice. It is unaffected by electrolysis, weather hazards or extreme temperature changes. Available as single or multi-conductor. Take advantage of the sales opportunities offered by RoMarine-RoPrene power cable. Sell it today. Descriptive Bulletin RR-1 will be gladly mailed upon request.

IT COSTS LESS TO BUY THE BEST

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ELECTRO cuts 1 man out of 2
from your installation
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3 EASY STEPS

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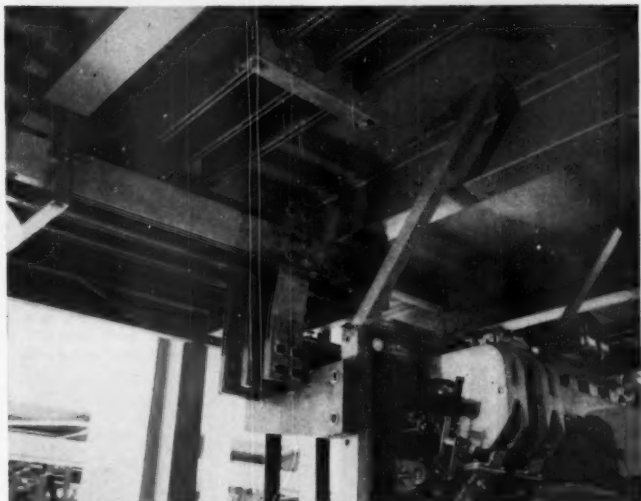
STEP 2

STEP 3

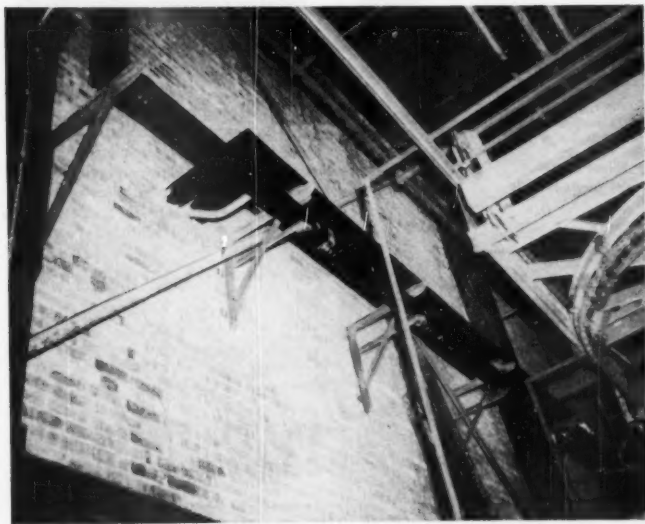
—THAT'S ALL!



Practical Methods



FEEDER BUS DEAD-END and branch connections under 1125-kw. electric enameling furnace at Hotpoint's new range plant in Chicago. Z-top branch serves 10 contactors, each controlling a separate heat zone in furnace. Copper buses were fabricated to unusually close tolerances and installed on insulating supports under oven floor by Sweningson & Company, Chicago electrical contractors on the project.



DOUBLE-TIER WALL BRACKETS, fabricated of angle-iron, support three runs of 4-inch square duct enclosing control and instrument conductors for huge 1125-kw. electric enameling furnaces at Hotpoint's new electric range plant in Chicago. Installation by Sweningson & Company Chicago electrical contractors and engineers.

Service Mast For Low Buildings

WIRING

The trend toward low, one-story, ranch-type residential units has posed some problems with respect to overhead electrical service. Most important is that of maintaining adequate clearance over yards and drives and still have a rigid service support.

Numerous methods have been used to bring the service wires above the roof eaves. Some contractors install 4 in. by 4 in. or 4 in. by 6 in. wood supports with the necessary service bracket, service head and conduit attached. Others have installed the conduit drop in the web of a steel channel to provide the desired rigidity.

While using the latter method on a large residence, electrical contractor Edward J. Fisher of Battle Creek, Michigan, decided to improve the technique. His answer to low-roof service installations was the design and fabrication of a steel service mast that could be sold and installed as a packaged unit including service head, service bracket and meter box connection.

The specific design, for which he has a patent pending, uses a 2-inch hollow square steel section to provide the necessary rigidity against bending under conductor and storm loading and also act as the lead-in conductor raceway. Attached to the top of the mast is a weather-head with a square, bolt-mounted coupling. Directly under



STEEL SERVICE MAST of 2-inch hollow section provides rigid service entrance with necessary clearance to a low-roof refreshment stand. Note bracket and service head at top.

New

GUTH LITE-BLOX

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*Infinite Design Freedom
"Hand-Crafted" Appearance
...in a packaged troffer*

NEW DIMENSIONS IN LIGHTING, PATTERN, DECOR—an endless variety of lighting systems based on 12" grid, simply by replacing ceiling blocks with Guth LITE-BLOX Troffers.

"BUILT-FOR-YOU" LOOK—snap-on trim in a choice of smart, modern finishes gives that tailored touch!

ARROWS OF LIGHT—rows line up arrow-straight with precision-built Guth LITE-BLOX.

INSPIRINGLY VERSATILE—20 sizes all with same cross-section, wide range of diffusing and shielding media to meet your exact visual or design requirements.

FUNCTIONAL BEAUTY—Guth LITE-BLOX Troffers are engineered to short-cut installation and maintenance costs.

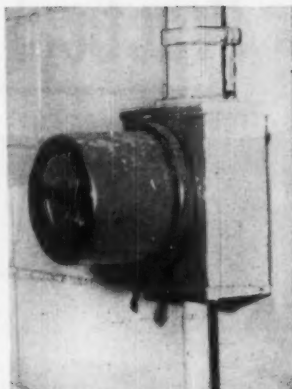
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BOTTOM OF MAST terminates at outdoor meter box with a bolted flange connection.



SERVICE MAST installed on a ranch-type home.

and at 90 degrees to the service head can be mounted (bolt connection) either a three-spool service bracket or single-spool insulator clevises. The mast passes through the eave of the roof and terminates in a meter box fitting. A flanged plate supports the mast at the roof line and U-shaped straps secure the raceway to the building wall.

Standard mast length supplied by Fisher is 8-ft., 6-inches; the longest is 20-ft., 6-inches.

Stud Gun Speeds Conduit Installation

CONSTRUCTION

The use of a self-contained cartridge-type gun shooting $\frac{1}{4}$ -inch diameter threaded studs into steel I-beams and concrete walls reduced installation time nearly 80 percent. These facts were verified by Jack Cummins, fore-



POWDER-ACTIVATED TOOL is placed in position, turned 180 degrees, shoved sharply forward. Threaded studs are shot into steel and concrete with tremendous holding power. Installation time is less than a fifth that of manual means.



CONDUIT BOX is lifted into position over threaded studs and is secured by means of small nuts. Studs are fired in exact position through a metal anti-spalling template. Use of the tool is fast, sure and safe.

man for the Lord Electric Company, Pittsburgh, during the construction of Gulf Oil's new Research Laboratories at Harnarville, Pa.

Before adopting the gun method, conduit boxes were installed by manually drilling and tapping holes to hold studs. The average time of installation under these conditions was between 15 and 20 minutes per box.

After putting the powder-actuated tool into service, the conduit boxes were installed in two minutes time, a reduction of over 80 percent. The gun, developed by the Mine Safety Appliance Company, takes the 1/2-inch stud into the barrel and, when the muzzle is placed against the I-beam or wall and when the tool is pushed forward sharply, the stud is fired into the surface and is secured with a holding power exceeding 2000 pounds.



EASTGATE APARTMENTS

DRIVE-IT "300" cuts fastening costs 50% on Big Boston Apartment Job!

Over 9000 drive-pins were used at the Eastgate Apartments to fasten ceiling runner channels to concrete "at a saving of over 50%" writes the contractor.

Drive-It is one of the greatest cost-cutting tools ever invented. Hundreds of letters attest to the fact that steel or wood to concrete or steel fastening can be done with Drive-It at savings of 50% to 85% in man-hour costs!

Every architect, building engineer and contractor should investigate the DRIVE-IT system of fastening. It is Underwriter Laboratories approved for efficiency and holding power and engineered for *super-safe* operation.

Clip the coupon below and let us tell you how you, too, can save *safely* with DRIVE-IT!

Distributors Coast to Coast
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0702 S. W. Woods Street Portland 1, Oregon
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ONLY DRIVE-IT "300" GIVES YOU ALL THESE FEATURES

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- ☒ Automatic extension barrel



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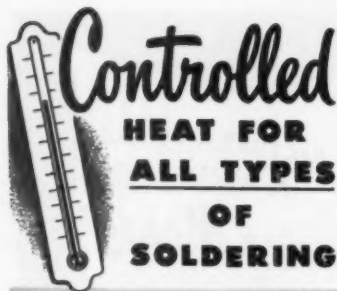
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With 250-Watt WELLER GUN

No need to change tools for light or heavy soldering. The 250-watt Weller Soldering Gun does both with controlled dual heat. 5-second heating saves time and current on every job. Your Weller Gun pays for itself in a few months.

Check These
Time-and-
Money
Saving
Features



TRIGGER-SWITCH CONTROL—Governs heat for light or heavy work. Saves power because no need to unplug gun between jobs.

SOLDERLITE—Spotlights the work. Lets you see what you're doing at all times.

5-SECOND HEATING—No waiting, no wasted current. Saves hours and dollars each month.

LONGER REACH—Lets you get at any job with ease. Slides between wiring—into the tightest spots.

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DUAL HEAT—Single heat 200 watts; dual heat 200/250 watts; 120 volts, 60 cycles.

See the new 250-watt Weller Soldering Gun today at your distributor—or write for bulletin direct.

SOLDERING GUIDE—Get your new copy of SOLDERING TIPS—revised, up-to-date and fully illustrated 20-page booklet of practical soldering suggestions. Price 10c at your distributor, or order direct.



WELLER

ELECTRIC CORP.
815 Packer Street, Easton, Pa.

To direct the studs into exact position, a metal anti-spall ring was used as a template. Accidental discharge was prevented by the design of the gun which required a 180-degree turn before the firing pin was brought into line with the cartridge primer.

In addition to installing outlet boxes, Mr. Cummins found that the gun was useful in fastening conduit clamps to concrete ceilings and members of both new and remodeled buildings.

Tote Boxes For Recording Instruments

STORAGE

Recording instruments are important—and expensive—equipment items used for electrical system surveys and testing at the Guarantee Electric Company, enterprising St. Louis electrical contracting and engineering firm.

To insure accurate recording, such instruments must be handled with care and kept in top operating condition at all times. One means of assuring this is to provide safe storage facilities and a convenient means of handling and transporting the instruments to the job.

To accomplish this, Guarantee Electric has designed and constructed tote boxes of 3/4-inch, seven-ply wood with hinged top and special ply-wood partitions to hold the instruments snugly. Smaller partitions in each box house the necessary instrument cables, charts and other accessories. A metal handle is mounted to each side of the box.

The boxes can be stacked for storage and used as a base during the test.



PLYWOOD TOTE BOXES house recording instruments at Guarantee Electric Company; provide safe and convenient storage and transportation facilities.



INTERIOR VIEW OF BOX housing a recording wattmeter shows snug instrument fit and small partitions for cables and accessories.



ELECTROSTATIC AIR FILTER CELLS get thorough cleaning in one of the air intake rooms at Terrace Plaza Hotel in Cincinnati. Cell plates accumulate deposit of dirt, dust and grime; are washed in tank with revolving brushes (hand operated) at left, then set on drain table at right to dry. Excess cleaning liquid drains back into wash tank. Cleaning equipment is installed in each air intake room adjacent to electrostatic air cleaning equipment.

not one
... but all three

the
"Dutch Brand"
trio...

ALL THREE TAPES ARE IMPORTANT
TO MEET THE SPECIFICATIONS OF THE
ELECTRICAL TRADE



PLASTIX, FRICTION, RUBBER TAPES

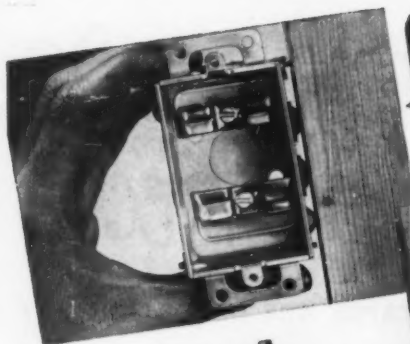
Those in the electrical trade know that each job presents its particular problem which has to be worked out for greatest efficiency and economy. This requires the careful selection of materials and the application of know-how methods. No one tape has all the qualities needed but one tape may prove more efficient for one type of work and a combination of two tapes may prove better for another. That's why we offer all three tapes **PLASTIX**, Friction and Rubber. One or a combination of these dependable tapes will fill your requirements. Have all three on hand... order them from your jobber today.

All three tapes are
available in practical
sizes and packaging
for convenient use.

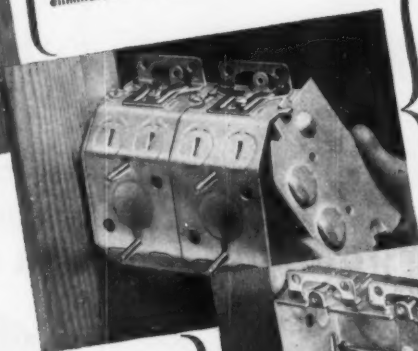


VAN CLEEF BROS. INC.

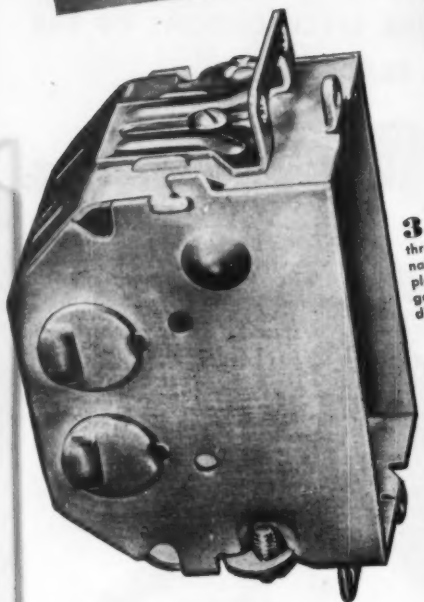
Manufacturers of Rubber Products... Est. 1910
CHICAGO 19, U. S. A.



1 Four contact points — in place of the usual three — make the job of leveling the box against the studding a sure, easy one. Tilting or rocking of the box is eliminated — the job is speeded.



2 Wedging action of the new locking mechanism securely locks side plates of the box in position. Boxes are easily gangable.



3 In addition to nail-through holes, an extra set of nail holes through the side plates allows speedy gang mounting of box direct to studding.



4 The new single-screw ear allows adjustments from slightly above to $\frac{3}{8}$ -inch below the edge of the box. Note the sturdy ribbed design and the heavy bridge across the ear for increased strength. Ample space within the bridge easily accommodates device strap.



Listed By Underwriters' Laboratories, Inc.


NOW G.E. Offers You a Switchbox That Really Cuts Installation Time

Once you've tried the new General Electric Levelock switch box, you'll really appreciate the way it saves your time and temper. Check the big features of the Levelock—features built-in specifically to help you solve your on-the-job problems. Levelock's ingenious construction locks side plates securely in place.

You'll like the ease of installation afforded by the nail-through feature and the extra leveling projections.

General Electric Levelock boxes are easily gangable with old-type units for use on modernization jobs. They are available in all of the most

popular types. We're sure you'll welcome their many time-saving features. Get them from your local G-E distributor and try them on your next job. Section C15-918, Construction Materials Department, General Electric Company, Bridgeport 2, Connecticut.

You can put your confidence in—
GENERAL  ELECTRIC

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want more information on products or services advertised?

want advice on a technical problem?

want to ask a question and get a helpful answer?

want interpretation on a code provision?

AN EXPANDED SERVICE TO YOU

Save time, trouble and money. We will tell each manufacturer to send you the information you want. Instead of writing many letters to get the material you need, just fill in this easy-to-use postcard and we will do the rest. For years we have been rendering this service on catalogs and bulletins . . . now we expand this service to include every department. It's free . . . It's as useful as you make it.

other problems? turn the page for the answer

We suggest that you tear out the bottom card before you start reading the following pages. Keep the card handy. You might even use it as a book mark in case you are unable to complete reading the following pages at one sitting. Then, as you see some new products about which you want to know more, just circle on this card the number which appears at the top of the item describing the new product or catalog. Circle each number on this card which corresponds to the number on the item in which you are interested.

If you want to know more about something which is advertised in this issue, put the number of the page on which the advertisement appears in one of the squares at the bottom of the card. If you want further information on the product advertised on page 16, for example, just put a 16 in one of the squares. When more than one advertisement appears on a single page, include the manufacturer's initials together with the page number (16-A&B)

USE THIS CARD

- • • to get more information on new products
- • • to order catalogs or bulletins
- • • to secure additional information about a product or service mentioned in any advertisement in this issue.

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The Editor,
ELECTRICAL CONSTRUCTION AND MAINTENANCE
330 West 42nd St.
New York 18, N. Y.

ELECTRICAL CONSTRUCTION AND MAINTENANCE
330 W. 42nd St., New York 18, N. Y.

Not good
after November 1st

Please send me without obligation, the new product information or catalogs described on the following pages and identified by numbers circled below.

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| 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 |
| 61 | 62 | 63 | 64 | 65 | 66 | 67 | 68 | 69 | 70 | 71 | 72 | 73 | 74 | 75 | 76 | 77 | 78 | 79 | 80 |
| 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90 | 91 | 92 | 93 | 94 | 95 | 96 | 97 | 98 | 99 | 100 |
| 101 | 102 | 103 | 104 | 105 | 106 | 107 | 108 | 109 | 110 | 111 | 112 | 113 | | | | | | | |

Advertising
on page . . .

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NAME TITLE

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Electrical Construction and Maintenance is written for you by a large staff of editors and consultants, each an authority on some phase of the business. They will be glad to give you expert advice and answers to your questions.

other problems? turn the page for the answer.

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Reader Service Department

ELECTRICAL CONSTRUCTION AND MAINTENANCE

330 West 42nd St.

New York 18, N. Y.

USE THIS CARD TO ASK THEM!

Do you have a problem in wiring layout, motor control, lighting technique?

Ask the editors.

Do you want advice on cost analysis, billing procedures, market conditions, or government regulations?

Ask the editors.

Do you have a gripe? Want to read more articles on some subject? Want to ask a question about some article you read in this issue?

Use the card.

To secure further information on new product or new catalog and bulletin items listed elsewhere in this section, use the card on the other side.

Product News



Control Center (1)

Announcement has been made of a complete new control center design; incorporating "Plug-In" units, new safety handle mechanism, new circuit breakers, new starters and new switches. Up to six Size 1 or 2 starters can be mounted in a standard vertical section 20 inches wide by 20 inches deep by 90 inches high. Plug-In units have positive pressure studs which grip round vertical busses. Units slide on corner guide rails to make removal or exchange. Safety handle provides for four padlocks to lock both door and disconnect in either on or off position. On closing unit door, handle moves to indicate position of disconnect. Circuit breakers are Type ML thermal magnetic with trip-free, non-tamperable, factory calibrated protection.

Square D Company, 4041 North Richards St., Milwaukee 12, Wis.

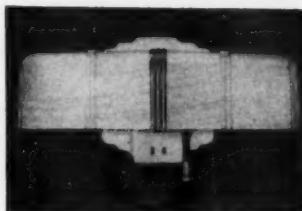


Lighting Fixtures (2)

Announcement has been made of the addition of a series of explosion-proof lighting fixtures and a series of dust-tight lighting fixtures to this line. LE Series, explosion-proof (Class I, Groups C and D) are for use in locations where highly flammable materials are manufactured or handled. Rugged, flame-tight cast aluminum alloy housings render internal explosions harmless, and insure safe operating temperatures. Threaded con-

struction permits easy access to interior for wiring and lamp replacement. DE Series, dust-tight (Class II, Groups E, F, G, and Class III) for use in locations where flammable dusts are present in quantity. One-piece cast aluminum alloy housings are designed to exclude dust from interior and avoid accumulation of dust on exterior surface. Available in many types and sizes.

Pyle-National Company, 1334 North Kostner Ave., Chicago 51, Ill.



WALL BRACKET featuring twin sockets and an extra outlet has been announced. Suitable for residential, commercial, institutional or industrial installations. Twin sockets take two standard 60 watt bulbs, both operated by porcelain-tipped pull chain. Fixture is equipped with opaque glass shade 11 1/4 inches long, 3 3/4 inches wide and 3 1/4 inches high. Base size is 5 1/2 inches by 5 inches and fits 3 1/4 inch and 4 inch outlet or Gem X boxes. Manufactured by John I. Paulding, Inc., New Bedford, Mass.

Floodlights (4)

Low-cost lighting for many commercial, industrial and residential applications is obtained with the new 813 Flood-Lite. It features a totally enclosed 75-300 watt medium base socket, and a 10 inch heavy gauge aluminum reflector with "Sealed-Brite" finish. Flexibility is provided by a wing-nut adjuster, and a variety of mountings: on vertical and horizontal surfaces, standard 4 inch and 3 1/2 inch outlet boxes, and on the ground with steel spike accessory. Clear or diffusing lenses are available. They are convex, semi-heat resisting, and assembled with gaskets in clamping rings.

S & M Lamp Co., 119 West 36th Place, Los Angeles 54, Calif.



Fittings (5)

Announcement has been made of a new heavy hot dip galvanized finish on all Gedney threaded conduit bodies, covers, straps and clamp backs. Finish provides more zinc in a much thicker coat than ordinary electroplating, thereby insuring protection against deterioration. New fittings offer advantages in all locations where humidity, exposure to weather, condensation or corrosive conditions exist.

Gedney Electric Company, RKO Building, Radio City, New York 20, N. Y.



Driver (6)

A new HydraRam knockout punch driver for enlarging knockouts or cutting new openings for conduit up to 4 inches has been introduced. Developing over 11 tons of hydraulic pressure, it drives knockout punches through 10-gauge metal. It is portable and comes as a set in a metal carrying case with compartment for punches. Set includes a hand hydraulic pump, high pressure hose and ram with extension and sleeves to accommodate all Greenlee knockout punches for making holes for 1/2 inch up to 4 inch conduit. It also may be used with radio chassis punches.

Greenlee Tool Co., Rockford, Ill.



MODERN FITTINGS FOR

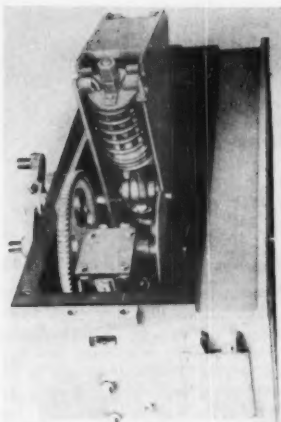
- thinwall conduit
- rigid conduit
- metallic and non-metallic cable
- flexible steel conduit
- service entrance cable
- grounding devices
- lighting fixture fittings

manufacturers for over 30 years

Sold Through Electrical Wholesalers
representatives in principal cities

midwest electric mfg. co. • 1639 walnut st. • chicago 12, ill.

midwest



Transfer Mechanism (7)

A new selective automatic transfer mechanism with remote operator control of feeder selection for use with G & W load break oil switches has been developed. Model E6 mechanism is for use with either a double throw switch or two single throw switches supplying one load from either of two feeders. With one feeder selected as "preferred" and the other as "emergency", it will automatically transfer load from "preferred" to "emergency" upon failure of "preferred", and back to "preferred" when that feeder is re-energized. The remote operator control feature allows operator to transfer load at will between the two feeders to balance feeders during periods of peak demand or to isolate one feeder for repairs or maintenance.

G & W Electric Specialty Co., 7780 Dante Avenue, Chicago 19, Ill.

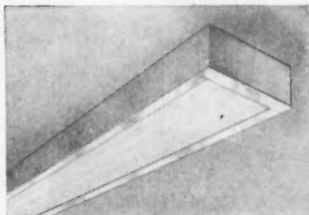


Cutout (8)

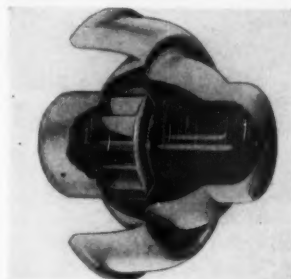
Two new 100 ampere open-dropout cutouts with heavy-duty interrupting ratings of 5000 amperes have been announced. Available in 5.2 and 7.8 kv maximum ratings. Standard G-E cutouts already in service can be converted to heavy-duty by replacing standard fuseholder with new interchangeable heavy-duty fuseholders. New cutouts feature close coupling of

fuseholder and insulator to reduce recoil stresses on porcelain, and a fuseholder sealed at upper end to prevent power arcs and flashover. Because mounting bracket is cemented into porcelain on opposite side from live parts, birds and animals are prevented from "bridging" insulator and blowing fuses. A time delay of 5 or 6 cycles for contact-separation eliminates arcing at contacts, which are silver plated to prevent corrosion.

General Electric Company, Schenectady 5, N. Y.



NEW SURFACE LITE-BOX enclosures offer new lighting design possibilities. Available finished with 300° white Permalux or with a primed surface ready for painting. Can be painted in matching ceiling colors that give the whole lighting system an individual built-in appearance. Manufactured by Edwin F. Guth Company, 2615 Washington Avenue, St. Louis, Mo.



Exhausters (10)

A new line of explosion-proof wall exhausters has been announced. They are flanged directly to outside wall. Motor is mounted outside the air stream, with entire unit on building exterior, away from possible explosive concentrations. Housings are constructed of aluminum, and non-ferrous centrifugal impellers are directly connected to ball bearing explosion-proof motors. Units especially adapted for roof applications are also available.

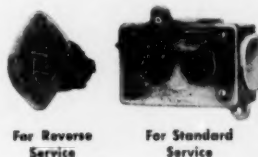
Jenn Air Products Co., 333 N. Pennsylvania St., Indianapolis, Ind.



Electronic Rectifier (11)

New floor- or wall-mounted electronic rectifier units, to convert ac to dc for general purpose industrial and commercial applications, are available. Standard units can be supplied with constant or adjustable dc output voltages, in ratings as high as 230 volts, 87 amperes. All components, including anode transformers, are mounted in factory assembled enclosures. Units are designed for operation from 115/230 or 230/460 volts, single phase or three phase.

Westinghouse Electric Corporation, Pittsburgh 30, Pa.



Wiring Devices (12)

Announcement has been made of obtaining higher ratings, with Underwriters' Laboratories approval, for following R & S receptacles, plugs and connectors; Midget Ever-Lok series; standard duty Ever-Lok, and type FS (waterproof) series, and 30 amp Ever-Lok devices. New rating for Midget Ever-Lok series is now 20 amp, 125 volt, ac; 15 amp, 125 volt, dc; 10 amp, 250 volt, ac or dc; ½ hp, 1 phase, 1 hp, 3 phase, 115 volt, 230 volt, ac. Ever-Lok standard duty and Type FS series have increased to 20 amp, 575 volt, ac; 30 amp, 250 volt, ac or dc. The 30 amp, Ever-Lok series' new ratings are 30 amp, 575 volt, ac, 250 volt, dc. Typical applications are for use in business offices, hospitals, hotels, institutional buildings, shops and factories, and with increased rating are suitable for fluorescent lighting and similar applications.

Russell & Stoll Company, Inc., 125 Barclay Street, New York 7, N. Y.

IMPROVED
Ramset Tool
FASTENS FASTER, EASIER
into steel or concrete



◀ TAP IT ...



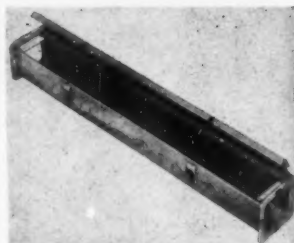
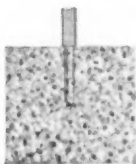
OR TURN IT ▶

Select the operating method that best fits the work. Load the tool with your choice from RAMSET'S 76 steel drive pins and threaded studs. Then **TURN IT ...** or **TAP IT!** The improved RAMSET DUAL-ACTION TOOL fastens instantly into steel or concrete. Only RAMSET gives you this *dual choice*...plus many other important advantages that make RAMSET the outstanding method for fast, easy, economical fastening. Ask for details and 15-minute demonstration of how you save time, money, trouble with dependable RAMSET FASTENING SYSTEM.

Ramset Fasteners, INC.

12117 BERE A ROAD • CLEVELAND 11, OHIO

PIONEER IN POWDER-ACTUATED FASTENING

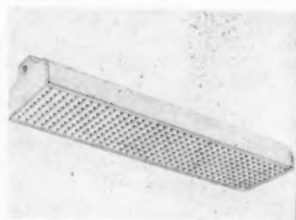


Wireways

(13)

Announcement has been made of the addition to this line of a newly developed $2\frac{1}{2}$ inch by $2\frac{1}{2}$ inch flanged type wireway for machinery and telephone wiring. Produced in one to five foot lengths, the new wireways are adaptable for use in connecting machinery to power lines, telephone wiring, and many other types of applications. Approved by Underwriters' Laboratories.

Keystone Manufacturing Company,
23328 Sherwood Ave., Center Line,
Mich.



(14)

FLUORESCENT lighting fixture, called "Varsity", has been announced by the Leader Electric Company, 3500 N. Kedzie Avenue, Chicago, Ill. Egg-crate louver is of plastic and swings from either side for re-lamping and servicing. Unit can be installed singly or in continuous runs. Available for 2, 3 or 4—40 watt lamps and for 2, 3 or 4 slimline lamps in lengths from 48 inches to 96 inches.

Tool Tray

(15)

A tool tray, readily mounted beneath Beaver's Model-G power unit by attaching to legs with bolts and wing nuts, has been announced. This device with vertical retaining edge makes it possible for workmen to lay tools and equipment in a handy position beneath machine while working. Also a new aluminum oil strainer which can be placed beneath the power unit over a five gallon pail. Oil and chips drop into beveled edge strainer.

Beaver Pipe Tools, Inc., Dana Avenue, Warren, Ohio

(16)

Electrical Metallic Tubing (17)

Annunciator

(18)

DRY-TYPE

Sub-Stations and Power Centers

for indoor installations

**Engineered
to meet**

Engineered to meet Your Exact Requirements

Not necessary to design or change your installation to fit a "standard"

Any type of primary switch gear.

Metering—primary or secondary, to suit.

Secondary breakers, main, branch, or tie.

Interlocked or automatic throw-over. Draw-out or stationary types.

Magnetic trip, or thermal, or combination.

All incorporated with high quality, liberally designed

Sorgel Air-Cooled Transformers

All factory wired, tested and assembled. Mounted on a substantial steel base. Shipped as a single unit or in sections, accurately co-ordinated for easy assembly on the job. Sizes up to 2000 Kv-a. All voltages up to 15 KV.

Send for new bulletin 450

2000 Kv-a. 12,000 volt sub-station, with primary fused load interrupter switch, temperature indicator and alarm, and extra contacts that may be used to operate forced draft fans to increase capacity 25%

Sales Engineers in Principal Cities

SORGEL ELECTRIC CO., 836 W. National Ave., Milwaukee 4, Wis
Pioneers in the development and manufacturing of Air-Cooled transformers

NEW-

**A valuable handbook
on your
D-C equipment**

Dusenbery's

D-C MOTOR MANUAL



*can help you select and
maintain this equip-
ment most efficiently*

- This new book provides the information which years of experience have shown to be most useful to the man responsible for the installation and maintenance of modern d-c motors, generators, AND ELECTRONIC CONTROL EQUIPMENT.
- It explains in clear practical terms how each part and circuit works; what type of motor is most efficient and economical under certain operating conditions; the latest methods of installing and servicing each part; how to reconnect motors; how to test for power and losses.
- It contains FULL INFORMATION ON BRUSHES—how to select replacements; how to be sure of proper installation.
- ALL THE LATEST CONTROL EQUIPMENT is fully explained, with complete instruction in the operation and maintenance of the Rotorol, Amplidyne, Maxspeed, Mot-O-Trol, Thy-Mo-Trol systems; rectifier tubes, etc.
- More than 7 pages of MAINTENANCE CHARTS give the symptoms and causes of every conceivable motor trouble or possible failure in any part of the control circuits. Clear wiring diagrams are given for every circuit.

*This book can save you expensive
and time-wasting breakdowns; can
help you get full benefit from today's
wonder-working direct current
equipment.*

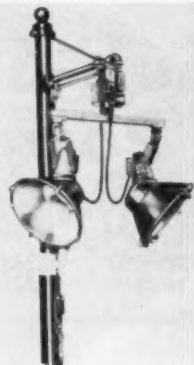
SEE IT FREE

The Macmillan Co., 40 Fifth Ave., New York 11

Please send me a copy of DIRECT CURRENT MOTOR MANUAL @ \$3.50. I will either remit in full or return the book within 10 days without further obligation.

Signed.....

Address.....

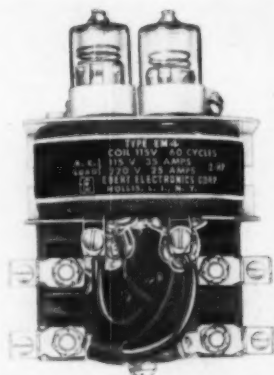


Suspension Yoke

(19)

A new dual-floodlight suspension yoke designed for use with outdoor models of Thompson disconnecting and lowering hangers. This device supports two ball-suspended floodlights from a single hanger, and it consists of a heavy-duty aluminum channel, two aluminum alloy adjustable angle fittings, and two 1-inch flanges with attaching cap screws. Two lights can be positioned and focused independently while operating on a common circuit. Floodlights of different types and weights can be utilized with this yoke and can be balanced by spacing adjustment on channel.

Thompson Electric Company, 1107-57 Power Avenue, Cleveland 14, Ohio



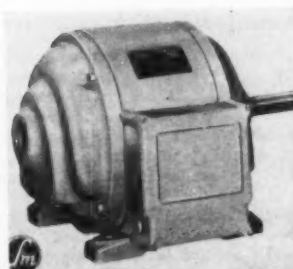
Relays

(20)

Announcement has been made of new two pole mercury plunger relays. Two standard EMT tubes are incorporated in one coil structure. This produces an efficient arrangement for loads up to 35 amperes 115 volt ac or 25 amperes 220 volt ac. Overall dimensions of two pole relay (Type EM-4),

are 4 1/4 inches high by 3 1/2 inches wide by 2 1/4 inches deep. Available with contacts normally open or normally closed. For special applications it is available with one contact normally open, the other normally closed. This permits instantaneous switch from one circuit to another. Contact is made from mercury to mercury when internal magnetic plunger is energized.

Ebert Electronics Corp. 18509 Jamaica Avenue, Hollis 7, L. I., N. Y.



Motors

(21)

Single phase capacitor type motors have been added to this line of "Klosd" drip-proof motors. They may be side-wall mounted, inverted ceiling mounted or floor mounted, and still retain drip-proof feature by rotating end bells so that air vent openings point downward. They have a newly designed starting relay that eliminates necessity of centrifugal switches or any rotating devices such as throw out switches, commutators, brushes, etc.

Sterling Electric Motors, Inc., Telegraph Rd. at Atlantic Blvd., Los Angeles 22, Calif.

(22)



INCANDESCENT luminaire, known as Magnalaire, is now available in two sizes, 75/100 watt and 150/200 watt. It is a luminous semi-direct fixture, of the totally enclosed globe type, and is applicable in hallways and other locations to match the Magnalux. Made by Westinghouse Electric Corporation, Pittsburgh 30, Pa.



Auth Electrical Signaling, Protective, and Communication Equipment is so varied in style, design, size, and function that there's scarcely a signaling or communication need that can't be met by an Auth product. Auth bells, buzzers, horns, push-buttons, chimes, telephones, or visual signals seldom fail to fit every application and every condition.

Complete signaling and communication systems for hospitals, schools, apartments, offices, stores, and banks are available. Protective equipment includes fire alarm, burglar alarm, and hold-up alarm systems. Marine bells, alarm panels, annunciators, and push buttons are other Auth specialties.



That's why the name AUTH is so readily acceptable — and why it will pay you to specify or recommend Auth products.

Have you a copy of the complete Auth catalog? If not, write for one now. Keep it handy as a ready reference.

MANUFACTURERS OF
Electrical Signaling,
Communication and
Protective Equipment for
Housing, Hospitals,
Schools, Offices, Ships,
and Industry.



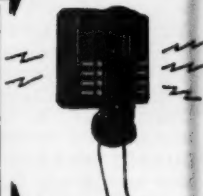
COMPLETE SYSTEMS • ONE RESPONSIBILITY
AUTH ELECTRIC COMPANY, INC.
34-20 45th St., Long Island City 1, N.Y.



WINK!



SMILE!



BECKON!



CALL!



SHOUT!



Peerless Electric

TYPE PVS

EXHAUST FANS

FEATURES

ALL-PEERLESS ELECTRIC UNITS—These fans are completely designed and manufactured by The Peerless Electric Company, a manufacturer of fans and motors since 1893. Both the motor and fan are designed to work together as a unit. This assures quiet operation and full rated output.

CAPACITOR MOTOR—Permanent split capacitor type using no internal switches or mechanical parts to fail and cause breakdowns. Totally enclosed to exclude all dirt and moisture drawn over the motor. Highest quality material available used on all parts for a trouble-free motor.

QUIET OPERATION—Wide heavy gauge steel blades rotating at slow speed to assure rated capacity at low noise level.

HORIZONTAL OR VERTICAL MOUNTING—Fans may be mounted in either position. Ball bearing in rear hood to take end thrust in all positions. Easy to lubricate and service.

FURNISHED COMPLETE—Controller for single speed, two-speed, or three-speed furnished with unit as ordered. No other switches or starting equipment required.

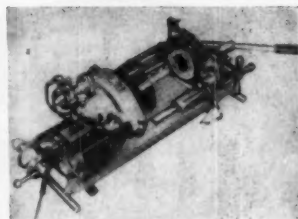
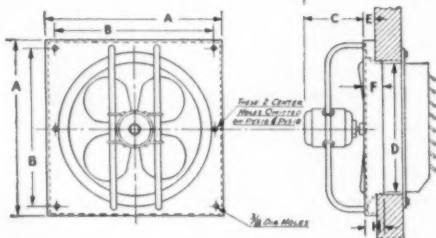
EASY TO INSTALL—Requires only 4 or 6 lag screws or bolts to mount. Opening may be round or rectangular—panel will cover all irregularities of cut opening.

GUARDS AVAILABLE—Neat appearing, protective guards for inlet side to eliminate hazards are available for all units.

EASY TO CLEAN—Streamlined surfaces allow cleaning in minimum time. Finished in gray Hammerloid baked enamel.

RATINGS—According to National Association of Fan Manufacturers and American Society of Heating & Ventilating Engineers.

GUARANTEE—Peerless Electric Fans and Motors are guaranteed against defective workmanship or material for a period of one year from date of shipment from factory. Each unit, when shipped, is registered and the serial number identifies it immediately for spare parts or duplicates.



Pipe and Bolt Machine (23)

Announcement has been made of a new Model-E Economy Model pipe and bolt machine. It is a 185 pound power tool for cutting and threading pipe, bolts and conduit. It has a total capacity up to 8 inches, lever fed and smooth operating. An outboard eccentric spool steady-rest prevents "whip" of long lengths of overhanging revolving pipe from "rocking" spindle. Model-E uses same die heads, same dies, same interchangeable wheel-and-roller or knife cutoff devices, same reamer arm and cone as Models A and B.

Beaver Pipe Tools, Inc., Warren, Ohio



Electrical Heating Elements (24)

A new type of electrical heating element has recently been introduced. It consists of a heat and chemically resistant glass on the surface of which has been fire-bonded an electrically conducting coating. Elements combine the versatility and electrical insulation properties of glass with the conductivity of new resistance materials. This makes possible heating elements of large area or unusual shape and possessing new performance characteristics. Elements can range from a low to a high transparency for transmission of visible light according to application requirements. Operate on 110 and 230 volt ac. In one type, heating coating is an integral part of container

| Model | Fan Diameter | Capacity C.F.M. | Motor H.P. | R.P.M. High | Recommended Sucker Size | FAN PERFORMANCE AND DIMENSIONS | | | | | | Shipping Wgt. |
|--------|--------------|-----------------|------------|-------------|-------------------------|--------------------------------|--------|--------|--------|-------|-------|---------------|
| | | | | | | A | B | C | D | E | F | |
| PVS-16 | 16" | 2150 | 1/8 | 1100 | 16" | 24 | 22 1/2 | 8 1/2 | 16 1/2 | 1 1/4 | 2 1/2 | 55 |
| PVS-18 | 18" | 2900 | 1/6 | 1100 | 18" | 26 | 24 1/2 | 12 | 18 1/2 | 1 1/4 | 3 | 75 |
| PVS-24 | 24" | 4550 | 1/4 | 820 | 24" | 34 | 31 1/2 | 12 1/2 | 24 1/2 | 1 1/4 | 3 1/2 | 90 |
| PVS-30 | 30" | 7375 | 1/2 | 660 | 30" | 40 | 37 1/2 | 13 1/2 | 30 1/2 | 1 1/4 | 3 1/2 | 145 |

THE *Peerless Electric* COMPANY
WARREN, OHIO

or piping and leads to efficient heating of contents. In a second type of heating application, elements offer high power, high efficiency radiant heater. In flat sheet form, they are called Pyrex Brand E-C radiant panels and are used for industrial drying and baking. Panels can have power inputs as high as 1500 watts per sq. ft. for operation in free air.

Corning Glass Works, Corning, N. Y.



Control (25)

Announcement has been made of a new Model X-1000 unit that provides automatic time control and commercial defrosting for a wide range of applications. Four different interval combinations may be set from outside by a single dial control. Each interval is variably controlled and infinite from five minutes up to the length of period selected. Starting time may be set for any time of day or night and by a toggle switch the controlled time can be either time on or time off. Junction block is accessible by conduit from two sides and bottom, and operation is with either 110-220 volt ac, 30 amp capacity, 100 amp in-rush, 60 cycle—25 or 50 cycle where needed.

Basic Products Corporation, 1617 North Harrison Street, Ft. Wayne, Ind.

Panel Meter (26)

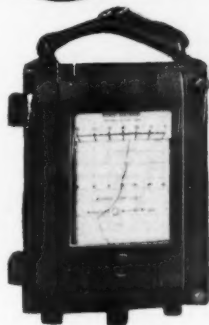
A new $4\frac{1}{2}$ inch hermetically sealed panel meter has been announced. Solder type zero adjuster provides adjustment without breaking seal. Rubber gasket is included for use as a pressure seal for panel mounting. Meter has a depth of $1\frac{1}{4}$ inches from front of panel. Available in a wide variety of standard ranges. Either 1% or 2% accuracy rating available. Dials are standard or specially calibrated, depending on requirements.

Marion Electrical Instrument Company, Manchester, N. H.

GETS ELECTRICAL FACTS DOWN ON PAPER!



PORTABLE RECORDER



Type CF-1

LIST PRICES
FROM \$110

With this G-E portable recorder you can get electrical facts easily—recorded in permanent form. Voltage surveys will provide data for improving lighting circuits where voltage variations are excessive. You can record motor currents, and forestall overloading or underloading. In many types of electrical investigations, this recorder can help you get the facts.

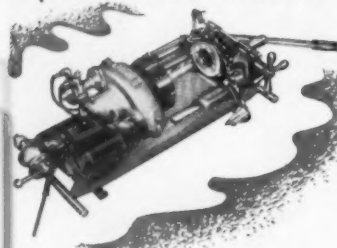
CF recorders are inkless—no problems of spilling or re-filling. They are light in weight, easily set or hung in place. They can be used indoors or out; extremes in temperature will not affect accuracy. A variety of chart speeds can be obtained; the recorder can run as long as 30 days without requiring a change of the record roll.

CF portable recorders are available in a number of types: a-c or d-c, voltmeters, ammeters, wattmeters, etc. For this and other G-E testing instruments see your local G-E distributor, or write Apparatus Department, General Electric Company, Schenectady 5, N. Y.

GENERAL  ELECTRIC

- LIGHTWEIGHT
- LOW-PRICED
- EASY-TO-MOVE

the New Beaver Model E Pipe and Bolt Machine



The new low-priced, lightweight Beaver Model "E" is a "junior edition" of the heavy-duty Beaver Model A—which has, for the past 20 years, been the recognized leader in the field of portable pipe and bolt machines.

The Model "E" uses the same dieheads—the same dies—the same patented interchangeable wheel-and-roller or knife cutoff devices—the same reamer arm and cone—as the Models A and B. This will be a great advantage to thousands of shops now equipped with the Beaver Model A or B because it eliminates the necessity of carrying in stock duplicate dies and parts—thereby preventing endless confusion and needless expense. And remember, there are 195 different kinds and sizes of dies instantly available for Models A, B or E.

Although designed primarily for hardware stores and small piping contractors, BIG contractors will find the new Model "E" useful on jobs requiring extreme portability.

A pipe machine is no better than the service back of it and our 50 years of experience in this field, and our reputation for high quality and friendly service, is your best guarantee of complete satisfaction.

WRITE FOR BULLETIN E

BEAVER

PIPE TOOLS

232-300 Dana Avenue • Warren, Ohio, U. S. A.



Spotlight

(27)

A new fixture, No. 512, has been added to this line of Adjust-O-Spot units. It has a shallow recess depth. Construction of fixture embodies a sphere, semi-recessed into a 5½ inch deep cylindrical steel housing. Sphere may be rotated up to 360 in the horizontal plane, and tilted to 41° from the vertical. Unit has been engineered for operation with the R40 and PAR 38 reflector lamps. When used with latter, a concentric louver and color filter may be attached to sphere opening. Approved by Underwriters Laboratories.

Litecraft Manufacturing Corp., 790 Wythe Avenue, Brooklyn 11, N. Y.



Midget Puller

(28)

A new, larger capacity midget puller for line maintenance work has been announced. A hand-operated hoist or puller, it weighs 9½ pounds, takes up less than a foot of space, and handles 1,000-pound load on any lifting, stretching or pulling job. Handle serves a double purpose. It may be used as a straight lever when loads are heavy, or where lack of headroom allows only partial strokes; or lower section may be locked at right angles to upper section, forming a crank for high-speed lifting of pulling.

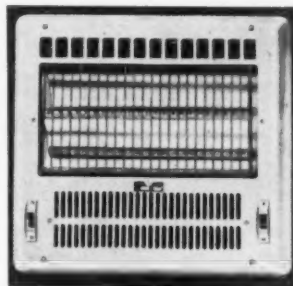
Coffing Hoist Co., Danville, Ill.

Ground Clamp

(29)

A new light weight ground clamp of 300 ampere capacity, known as GC-3, has been developed. It is designed to provide a convenient, readily movable, yet solid ground connection for welding jobs where welding currents do not average over 300 amperes. Clamp weighs 1½ pounds and has a jaw spread of 2½ inches. A heavy direct acting spring gives a positive, slip-proof connection with the work.

Lincoln Electric Company, Cleveland, Ohio

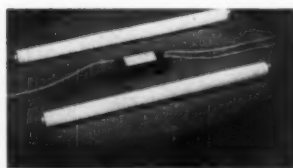


Heaters

(30)

Two new series of radiant type recessed wall Heetaires (without fans) of the higher wattage type, have been added to this line. Series 207 and 208 have the patented Neo-Glo elements, with wattages of 1500 and 200, and are available with two-heating speeds or with built-in thermostat. Two switches on manual-control models permit user choice of two heating speeds—one element on alone, or both elements on. The "T" models have thermostat built in. One dial automatically controls Heetaire so that it produces and maintains temperature from 40° F to 85° F, turning itself off and on as necessary.

Markel Electric Products, Inc., and LaSalle Products, Inc., Buffalo, N. Y.



Ballast

(31)

A new "Trigger-Start" ballast for operation of two standard 20-watt fluorescent lamps has been announced. It is recommended for both commercial and residential fixtures. Ballast does away with need for starters and starter

G.E.'s 9574

**all-purpose
insulating varnish provides**

**BETTER BONDING
BETTER PENETRATION
NO SLUDGING**



Mr. Guy W.
Probst

That's what Guy W. Probst, owner of the Lockhaven Electric Repair Co., Lockhaven, Pa., says about General Electric's 9574. Here is his statement:

"G-E all-purpose insulating varnish 9574 gives you a cover coat you can see and that fills up between the Formex wires. I've had very good success with it on armatures up to 2000 RPM. On formed coils I can bake before forming and the turns don't come apart when you pull the coil. I've had no trouble with sludging, and all my work is hot dipped. I find that I only use about half as much 1201 Glyptal as a cover coat on 9574 as I had to use over the varnish I had been using, and I get higher gloss and better bonding when 1201 is used over 9574."

**G-E 9574 gives excellent results on all types of coils except extra-high-speed armatures. It is one of G.E.'s complete line of electrical insulating materials, including adhesives, wedges, cements, compounds, cords and twines, sleeving, wire enamels, mica, papers and fibers, permafilms, tapes, tubing, varnished cloths, varnishes.*

You can put your confidence in

GENERAL  ELECTRIC

CD50-K2

ELECTRICAL CONSTRUCTION AND MAINTENANCE . . . SEPTEMBER, 1950



EASY TO USE

BAKES AT LOWER TEMPERATURES than is possible with most other synthetic varnishes.

PENETRATES EASILY into the deepest coils.

NO SPECIAL THINNER required (just petroleum spirits).

STABLE—will not tend to harden in the tank.



**SEND FOR
BULLETIN!**

If you haven't yet tried G-E 9574, get in touch with your local G-E Distributor, or write for our new bulletin to Section K-2, Chemical Department, General Electric Company, Pittsfield, Mass.



**KEEP
YOUR
EYE
ON
QUALITY**



**A FINE LINE
OF PERFORMERS**

Through ceaseless search for improved construction, new materials and improved methods of manufacture, Leviton has developed a complete line of electrical devices, each designed to do a precise job.

Whatever your requirements, you can specify Leviton with assurance of the right style, the right quality, and the price to fit your job.

No. 8826C

Made of sturdy one-piece bakelite, amply reinforced to withstand hard usage under all conditions. Fits either 3 1/4" or 4" outlet boxes. New improved cover keeps built-in mechanism dust free. Large exposed terminals for easy wiring. Available in white or brown with 3 types of chain lengths and connectors.

No. 8815C

Same construction as above, made of white glazed porcelain. Glazed track for easy chain movement.

No. 9816CX

Two piece glazed porcelain receptacle with removable interior having close fitting top for protection against dust. Either in 3 1/4" or in combination for 3 1/4" and 4 inch boxes. 3 types of chain lengths and connectors. Also available with convenience outlet.

See the complete Leviton line
at all leading distributors



LEVITON MANUFACTURING COMPANY

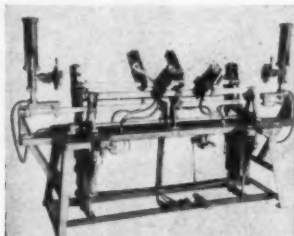
MAIN OFFICE and FACTORY: BROOKLYN 22, N. Y.

WAREHOUSES: CHICAGO and LOS ANGELES

In Canada: No. 2, Board of Trade Bldg., Montreal

blocks in fixture. It also features a "brickette" cross section that keeps noise level to a minimum. Unit is 6 1/2 inches long and 2 1/4 inches wide. Listed by Underwriters Laboratory.

General Electric Company, Schenectady 5, N. Y.



Coil Spreader (32)

Announcement has been made of an air operated coil spreader, which will form coils for motors in exact shape they will occupy in armature or stator. Holders take coil sizes from 30 to 155 inches. Hand operated clamps have been replaced by air operation. Spreader has compensating attachments. Coil holder bars are so constructed that they can be swiveled on axis. Also there is a compensating cylinder which places the bottom of rear coil cross-section and top of front coil cross-section on pitch radius of stator or armature, giving the coil shape it will occupy in stator.

Porter & Rayfield, Inc., Atlanta, Ga.



Acetylene Gun (33)

A new acetylene gun, known as Prestomatic, has been announced. It lights and shuts off automatically by touching or releasing trigger. By use of readily changeable combustion tubes, it can give flame sizes to cover jobs from heavy soldering, or heating up to 2800 degrees, to fine type of silver work. Its pistol shape fits the hand. Weight is 12 ounces. It comes with 1/4-inch, 5/16-inch and 3/8-inch combustion tubes.

Century Manufacturing Co., 5607 West Century Blvd., Los Angeles, 45, Calif.



Wireholders (34)

Announcement has been made of the addition to this line of fittings and fixtures the No. 3626 steel clad wireholders. Base and support strap are of heavy steel and screw is No. 22 with square shoulder, which eliminates slipping or turning when screwed into wall or pole. All parts are hot dip galvanized. Base has $2\frac{1}{4}$ diameter and supports insulator and relieves tension on screw when wire is pulled at an angle. Hole in porcelain is 1 inch diameter.

Blackhawk Industries, Dubuque, Iowa



Ladder (35)

A new dual-purpose, aluminum "featherweight" ladder has been announced. It serves as a ten foot straight ladder and a standard six foot step ladder. It is of reinforced channel type construction and designed for maximum strength with minimum weight. Ladder weighs about 15½ pounds, and each step can support more than 600 pounds. Special non-skid pads are mounted on flared rails to prevent slipping. Legs and top of ladder have a protective rubber coating to prevent marring of walls, woodwork and other surfaces.

Original Products Company, P. O. Box 9155, Fort Worth 7, Texas.



"White Knight"



2 AND 4 LAMP GENERAL DIFFUSE SLIMLINE LUMINAIRES

AVERAGE REFLECTANCE: 90% — AVERAGE EFFICIENCY: 80%

Name: Shore Bros.

Address: 4201 N. Broad Street, Philadelphia, Pa.

Type of Establishment: Automobile Showroom.

Area of Showroom: 180' x 52'.

Purpose: To light sales area and highlight displays.

Type of Units Installed: 96-inch, 4-lamp, WK 4-96-430

Slimline Luminaires operating at 425 MA. WK

4-150 Spot Boxes for display lighting.

Spacing: Continuous on 13' centers with 18" suspension on 14' ceiling.

* Level of Illumination: General—60 FC at 300 hours. Display 125 FC at 300 hours.



**METALCRAFT
PRODUCTS
COMPANY
INC.**
ESTABLISHED 1929

* According to Philadelphia Electric Company Survey

For complete details about the Slimline Luminaires used in this installation, write for Bulletin WK 2-4.

Manufacturers of Fluorescent Slimline Luminaires

306-308 CHERRY STREET • PHILADELPHIA 6, PA.

MARTINDALE

MOTOR DRIVEN FLEXIBLE SHAFT GRINDERS



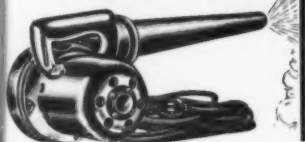
ROTARY BURS AND FILES



Set AB (Burs)

Set AF (Files)

BLOWERS AND
VACUUM CLEANERS



MARTINDALE COMMSTONES AND
COMMUTATOR GRINDING TOOLS



MICA UNDERCUTTERS FOR
SLOTTING COMMUTATORS.
Nine Motor Driven Types



MARTINDALE PROTECTIVE MASKS
Weigh less than 1/2 ounce.



Write for 64-page Catalog describing these
and many other products for Industrial
Maintenance, Safety and Production.

MARTINDALE ELECTRIC CO.
1309 Hird Ave. Cleveland 7, Ohio

Solenoid

A new short-stroke solenoid for heavy-duty industrial applications has been announced. It features a cast-permafil assembly. Basic component of device is a paper-layer wound coil, that holds voltage between turns to a minimum and reduces possibility of failure due to reduced voltage between layers of turns. Foot-long Flamenol leads are anchored and taped, and coil is placed in a mold into which liquid permafil is poured. After permafil hardens, coil assembly is baked. This results in a solid protective block around coil that is moisture-, oil-, shock- and vibration-resistant. Originally designed for high-speed, pilot-valve operation, it is ideal for any heavy-duty industrial application requiring a push-type solenoid with a maximum stroke that does not exceed $\frac{3}{8}$ in. Available in four models, including strokes of $\frac{1}{8}$ in. and $\frac{1}{4}$ in. and two stacking thicknesses.

General Electric Company, Schenectady 5, N. Y.

Product Briefs

(37) Seymour Smith & Son Inc., New York, N. Y. has introduced a new "Snap-Lock" plier wrench.

(38) Sylvania Electric Products Inc., Bayside, N. Y., has developed a sub-miniature photoelectric unit. . . (39) Irvington Varnish & Insulator Company, Irvington, N. J., has introduced a new electrical insulating tubing known as Irv-O-Flex. . . (40) Stanz-all, a new universal horizontal drill stand for use with $\frac{1}{8}$ inch and $\frac{1}{4}$ inch electric drills has been announced by Federal Engineering Company, New York, N. Y.

(41) Syntrol Company, Homer City, Pa., has introduced a new type of portable electric saw, with a Universal motor drive developing up to $1\frac{1}{2}$ hp., fitted with an $8\frac{1}{2}$ inch blade and having a $2\frac{1}{2}$ inch capacity. . . (42) Automotive Rubber Company, Inc., Detroit, Mich. has announced a newly designed metal formed grommet completely covered with rubber. It is designed for insulating blanked holes in metal. . . (43) Three new outdoor fluorescent "Half-Lites" for store fronts and business buildings have been introduced by the W. H. Long Co., Chicago, Ill.

(44) The development of a new fractional hp motor, model 700, was recently announced by the Electric Motor Corporation Division of Howard Industries, Inc., Racine, Wis. . . (45) Two PAR and R type lampholders especially designed for small area lighting needs have been added to the utility flood-lite line of S & M Lamp Co.,

Los Angeles, Calif. . . (46) A packaged temperature control unit, adaptable to any type heating system, is being marketed by the Master Control Company, Akron, Ohio.

(47) Forman Insulating Screw Corporation, New York, N. Y., has announced a new plastic-metal screw having the advantages of electrical insulation, shock resistance, and vibration damping. . . (48) Sherman & Reilly, Inc., Chattanooga, Tenn. has introduced a new snatch block for stringing electrical transmission line. . . (49) An expanded line of small size, precision, snap-action, electrical switches for industrial use is now offered by the Electro-Snap Division of the Exhibit Supply Co., Chicago, Ill.

(50) An improved design of demagnetizing coil was recently announced by General Electric Company, Schenectady, N. Y. . . (51) Flexible Sewer-Rod Equipment Company, Los Angeles, Calif. has announced a new machine known as "Roducter", designed to push, pull and rotate "flexible" steel rods in ducts. . . (52) Automatic Control Company, St. Paul, Minn. has announced a new liquid level control, called Mototrol with the Autoclon twin bellows design.

(53) The Porter-Cable Machine Company, Syracuse, N. Y. has announced two new, improved Guild saws, Models A-6 and A-8. . . (54) A machinist's vise, built on a new principle and embodying a patented fast slide action, has been announced by the Dodge Manufacturing Corporation, Mishawaka, Ind. . . (55) Ridge Tool Company, Elyria, Ohio, has announced a new 65R self-contained threader, which is jam-proof.




(56) A new automobile engine heater, called "Calrod" for quick winter starts has been announced by General Electric Co., Schenectady, N. Y. . . (57) Triometric, Inc., Pittsburgh, Pa. has introduced a low cost planning unit which enables anyone to lay out a single department or a whole factory without drafting tools. . . (58) A new type of 3-way fog nozzle that will extinguish oil, electrical, paint and many other types of fires with the least possible water has been announced by Bete Fog Nozzle, Inc., Greenfield, Mass.

(59) J. A. Weaver Company, St. Louis, Mo., has added the "WR" and "WL" silver platers which form a portable unit for silver plating electrical contacts on the job. . . (60) Agat-Detroit Company, Ann Arbor, Mich. has added a new high volume, self-contained collector for vapor and mist to its line of unit type collectors for industrial uses. . . (61) Portable Electric Tools, Inc., Chicago, Ill. has announced a new portable electric hand saw, known as the Zephyr Model









...Your best buy

Power cable installations consist of material —
cable  conduit  fittings  lugs  —
PLUS installation time 

The MANHOURS   required per installation
are proportional to the weight  of materials used.

ROCKBESTOS A.V.C.[®] carries more current.*

Therefore you can use smaller—lighter cable 
conduit  fittings  lugs 

The total weight  to lift, hang, pull, is
cut $\frac{1}{3}$ and installation MANHOURS 
are materially reduced.

Q.E.D. ROCKBESTOS A.V.C. SAVES MANHOUR \$

*National
Electric Code—
Chapter 10



ROCKBESTOS PRODUCTS CORPORATION

NEW HAVEN 4, CONN. New York • Cleveland
Chicago • Detroit • Pittsburgh • St. Louis • New Orleans
Los Angeles • Oakland, Calif.

FOR SAFETY

My Dear Watson!



the NEW ALLEN ground detector

Quickly detects and locates grounds in all wiring systems and equipment. It is the answer to the urgent and ever-increasing need for safety, reduction of costs of production, operation and maintenance of Industrial Plants.

**NO SHUT-DOWNS NECESSARY
IT ELIMINATES:**

**INTERRUPTION OF PRODUCTION—
SHUTTING DOWN OF POWER—
DAMAGE TO PLANT EQUIPMENT—**

when used on isolated (ungrounded) power distribution systems.

Write for Technical Information and Descriptive Bulletin



(62) The Talk-A-Phone Co., Chicago has introduced Redi-Power, a self-compensating power control unit, designed to overcome high noise levels and solve unusual intercommunications problems. . . . (63) South Bend Lathe Works, South Bend, Ind. has announced production of a new drill press in both bench and floor models. . . . (64) Don Good, Inc., South Pasadena, Calif. has announced a new low loss air spaced feedline for television and amateur installations.

(65) Associated Research, Inc., Chicago, Ill., has introduced a new field instrument for soil and ground resistance testing. . . . (66) Announcement has been made of a new portable guard unit combining floodlight, flashlight and extension cord for use in hard-to-reach places. It is produced by the McGill Manufacturing Co., Inc., Valparaiso, Ind. . . . (67) Corning Glass Works, Corning, N. Y., has placed on the market a new type of lightweight fluorescent lens panel.

Catalogs, Bulletins and Engineering Data

(68) EQUIPMENT FOR INDUSTRY, custom built, including motors, generators, frequency changers, battery chargers and electrolytic power supplies, is subject of bulletin 2-200. The Electric Products Co.

(69) EXTERIOR LANTERNS for churches, hospitals, hotels, institutions and public buildings are sketched and dimensioned in Folio L-50. Gruber Brothers, Inc.

(70) CONTACT SWITCH parts are pictured and specified in bulletin CS. Guardian Electric Mfg. Co.

(71) MAGNETIC AMPLIFIERS for high gain, high power and high performance for specific control requirements are discussed and pictured in data just issued. Vickers Electric Div. of St. Louis.

(72) COLUMN LIGHTS for gasoline stations, car lots, amusement parks, night clubs and similar locations are described and specified in 2-color bulletin 125-50. Steber Mfg. Co.

(73) STRESS RELIEF CONES for terminating high voltage electric cables are sketched and discussed in presentation A2-8. G & W Electric Specialty Co.

(74) LIQUID LEVEL CONTROL for elevated tank systems are presented in 2-color bulletin 1200. Automatic Control Co.

(75) CONDUCTOR RAIL SUPPORTS for crane applications, all mounting arrangements and 750-volt service are pictured and discussed in publication 5005. Delta-Star Electric Co.

(76) CIRCUIT BREAKERS, fully mag-

netic, non-thermal, non-enclosed, general purpose, are presented in 12-page bulletin 3410. Heinemann Electric Co.

(77) Q-FLOOR and the advantages of this type of wiring, with figures on savings in construction, is subject of booklet 18-110 UF. General Electric Co.

(78) PLANT LIGHTING is covered in two booklets, "Planning Guide to Improved Plant Lighting" and "Magno Flo". First booklet is designed for economics, program development and equipment selection. Second gives data and specifications for fixtures using slimline lamps. Benjamin Electric Mfg. Co.

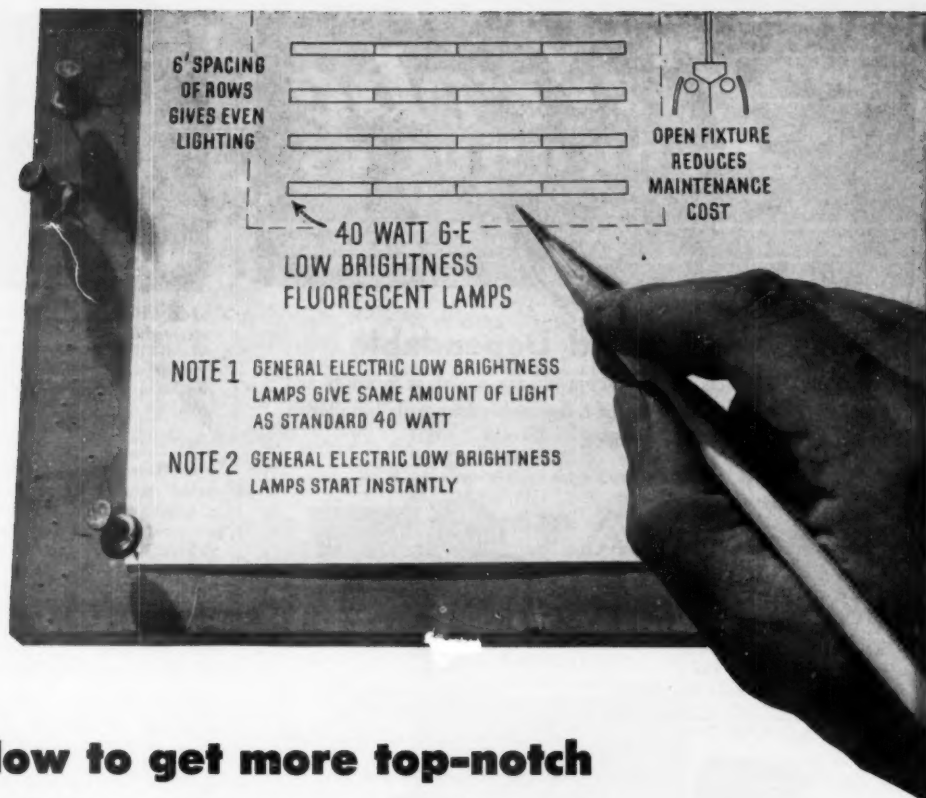
(79) DRILL PRESSES and their accessories are sketched, specified and priced in bulletin 402. South Bend Lathe Works.

(80) PHOTO ELECTRIC EQUIPMENT for industrial applications, production control, counting and alarms is presented in catalog 550. De-Tec-Tronic Laboratories, Inc.

(81) INSULATION BREAKDOWN TESTERS, both mobile and semi-portable, with capacities from 360-va to 5 kva and test voltage ranges from 3000-v to 30-kv ac, are subject of bulletin 5A. Associated Research, Inc.

(82) INCANDESCENT lighting for commercial and institutional uses, with wide selection of fixtures shown with dimensions, is subject of AIA File 31-F2. Gruber Brothers, Inc.

(83) AC WELDING unit rated for 200 amps. at 30 volts and a 50 percent duty cycle is discussed in file bulletin 1301 20M 1-50. The Lincoln Electric Co.



How to get more top-notch lighting jobs on your board

Here's a special lamp for special jobs—the General Electric *low-brightness* lamp. It offers the kind of advantages that are bound to help bring in more orders for top-quality lighting jobs.

REDUCED GLARE

These 40-watt T-17 fluorescent lamps give as much light as standard 40-watt T-12 G-E lamps, but deliver it from a much bigger tube. With low-brightness lamps reflected glare is reduced.

EASY MAINTENANCE

Low-brightness lamps are frequently used in open troffers and fixtures without cross louvers. That makes them easy

to get at for replacing and cleaning. For example, at the Flossmore school in Chicago, janitors clean the lamps with a vacuum cleaner attachment as they walk down each row.

INSTANT START

General Electric low-brightness lamps start instantly—and customers have no starters to maintain.

You'll find low-brightness lamps a good buy for schools, offices, and quality shops that want fine lighting. For more data, call your G-E lamp supplier or your nearest General Electric lamp district office.



GENERAL  ELECTRIC

FULLMAN

Latrobe PRODUCTS

★ FLOOR BOXES ★

★ WIRING SPECIALTIES ★



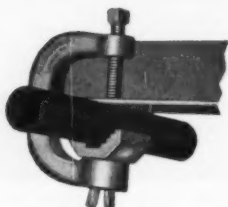
Clean-Cut and Dependable

"Latrobe" Products are tops in appearance as well as in utility and service. Their neat and compact design makes for speedy installation and long, trouble-free performance.



**No. 252-R "Latrobe"
Two Gang Box**

This popular Two Gang Box is adjustable and has our No. 208 Receptacle in one section. One Cover Plate has $\frac{1}{2}$ in. Flush Brass Plug; other has 2 in. Flush Brass Plug.



**No. 470 "Bull Dog"
Pipe or Conduit Hanger**

Made of highest grade malleable iron and cadmium plated, the No. 470 Hanger is unexcelled for hanging $\frac{1}{2}$ in., $\frac{3}{4}$ in. and 1 in. pipe or conduit to steel beams up to $\frac{3}{4}$ in. thick. Larger hangers for larger pipe.



**No. 284 Nozzle
with No. 200 Cover Plate**

Here is a compact Duplex Receptacle Nozzle with Brass pipe extension for quick installation and long dependable service. Furnished with $\frac{1}{2}$ in. or $\frac{3}{4}$ in. pipe extension.



**No. 280 Nozzle
with No. 200 Cover Plate**

10 Amp. 250 volt Receptacle in Brass Housing, mounted on $\frac{1}{2}$ in. Brass Pipe extension 3 in. long. Longer extension if desired.



**No. 110 "Latrobe"
Watertight Box**

This non-adjustable, watertight Floor Box is extremely simple and effective in design. Has No. 208 Receptacle and Cover Plate is $3\frac{1}{2}$ in. Diam. Easily and quickly installed.



**No. 130 Box—
No. 207 Nozzle**

An adjustable, watertight box that is excellent for installation in concrete or wood-finished concrete floors. Has $4\frac{1}{4}$ in. Cover Plate No. 242 and large Adjustable Ring No. 215.

FULLMAN MANUFACTURING CO.
LATROBE . . . PENNSYLVANIA



SECOND GENERATION was well represented at NISA conclave; W. S. Ward, Electric Motor and Repair Co., Raleigh, N. C. chats with G. H. Brown, Insulation and Wires, Inc., St. Louis, Mo.

(84) DISTRIBUTION transformers, air cooled power centers and lighting transformers from 1 to 1000-kva, are presented with descriptions in bulletin 50-FC. Marcus Transformer Co., Inc.

(85) SOLDERLESS CONNECTORS for electrical wiring, including crimping tools, splice caps, terminal lugs and insulators, are presented in 4-page bulletin 750. Buchanan Elec. Products Co.

(86) SWITCHBOARD of new design with attractive construction details and choice of either circuit breakers or fusible switches is specified in bulletin 502-A. Bulldog Elec. Products Co.

(87) METAL-ENCLOSED BUSES available in voltages up to 23-kv are current ratings as high as 6000-amps are sketched and described in 16-page 2-color publication 5006. Delta-Star Electric Co.

(88) LIGHTING STANDARDS: for traffic, flood and street lighting uses are sketched and specified in new booklet. The Elreco Corp.

(89) POWER CABLES of super coronol-geoprene up to 15-kv are presented with charts and tables, specifications, applications and splicing instructions. General Electric Co.

(90) LIGHTING FIXTURE HANGERS and accessories, pulleys, shock absorbers, terminals, brackets and winches are pictured, discussed and specified in 80-page catalog 50. The Thompson Electric Co.

(91) RADIANT GLASS panels for many uses are presented with power ratings and prices in catalog B86. Corning Glass Works.

(92) GEAR COUPLINGS are explained with aid of sketches, diagrams, tables

and text in 2-color 4-page folder. Sier-Bath Gear and Pump Co., Inc.

(93) TOOLS such as bench vises, clamps, power arms, foot controls and piston setters are described in bulletin 922. Wilton Tool Mfg. Co.

(94) WELDING SUPPLIES such as electrode holders, protective shields and cables are pictured and described in bulletin 467. The Lincoln Electric Co.

(95) TRANSFORMERS for rural service distribution, with either a secondary breaker, an arrester-load limited combination or with double gap and internal protective link, are subject of bulletin 61B6726A. Allis-Chalmers Mfg. Co.

(96) GENERATING PLANTS for standby service in hospitals, theaters, radio stations, etc., are discussed in folder A277. D. W. Onan & Sons, Inc.

(97) AUTOMATIC TRANSFER MECHANISMS providing automatic throw-over to an emergency feeder and automatic throw-back when the preferred feeder is re-energized are described in bulletins DA50, AM, EM, E6M and DT. G & W Electric Specialty Co.

(98) MASTER TELEVISION systems, including antenna, control-amplifier unit and distribution outlets, are discussed in 12-page catalog. Jerrold Electronics Corp.

(99) CATALOG SD 179 covers step down transformers and voltage and frequency compensating transformers. Acme Electric Corporation of Cuba, N. Y.

(100) ELECTRONIC TIMER providing automatic control for limit, operation



SMOKE rises from warm delegates as temperature hovers near 90 degrees and Al Clot, Peninsula Armature Works, Miami, Fla., relaxes with Ed Grant, Tennessee Electric Motor Service, Nashville, Tenn.

RAWLPLUG

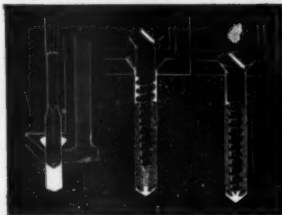
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PROponent of Efficient maintenance systems is Jesse G. Crowl, superintendent of maintenance, diesel engine plant, Caterpillar Tractor Co., Peoria, Illinois. His 30 years of experience with the Company as electrical foreman, general foreman and his present position, has led him to organize specialized crews to handle lighting, power, heat treat and general electrical maintenance.

and sequence timing, with 3 ranges between 0.06 and 120 seconds, is diagrammed and described in publication CR7504A142. General Electric Co.

(101) **PHOTO-FLASH** electrolytic capacitor for use with flash lamps is pictured and explained in file sheet 514. Cornell-Dubilier Electric Corp.

(102) **SPEED DRILL** of 1/2-inch chuck size with many new construction features is presented in bulletin 400-50. Speed Way Mfg. Co.

(103) **TUBE CHARACTERISTIC** booklet on receiving tubes for AM, FM and television broadcast covers more than 450 tubes and kinescopes. Form 1275E. Radio Corp. of America.

(104) **SECTIONAL SCAFFOLD** of aluminum for construction and maintenance work are discussed in 4-page bulletin PSS-20. The Patent Scaffolding Co., Inc.

(105) **FITTINGS AND FIXTURES**, weatherproof and vapor tight, are pictured and specified in cardboard folder E2-50. The Adalet Mfg. Co.

(106) **PORTABLE** high current test unit operating on 110-volts 60 cycles supplies any current up to 500 amps for testing overload relays for ac motors rated up to 250 amps. File folder describes it. Custom Electric Controller Co.

(107) **VARIABLE DC** voltage from ac power line through use of the Vari-cell is explained in 2-color folder. Superior Electric Co.

(108) **INSULATING MATERIALS** product list alphabetically arranged for rapid reference for distributors and manufacturers. Insulation Manufacturers Corp.

(109) **COMBINATION** catalog and manual discussing 25 types of dc and ac converters, phono-motors and record player converters, battery chargers and eliminators is available. Cornell-Dubilier Electric Corp.

(110) **LUMINAIRES**, fluorescent and slimline as well as incandescent down lights, spots and lens boxes are sketched, specified, discussed and dimensioned in condensed lighting guide L50. Garden City Plating and Mfg. Co.

(111) **WELDING CONNECTOR** for rapid joining of cables and positive contact is discussing in 2-color file sheet. Joy Manufacturing Co.

(112) **MICRO SWITCH** for controlling high speed container unit is described in file insert. Minneapolis-Honeywell Regulator Co.

(113) **CONDULETS**, plugs and receptacles, controls panelboards, lighting fixtures and signalling devices are pictured, specified and priced in catalog 3100. Crouse-Hinds Co.



CHARLES S. HELLDOERFER, partner of Helldoerfer & Castellini, electrical contracting and engineering firm of Dayton, Ohio, believes salesmanship to be a prime asset in the contracting field. Formerly an engineer with the Dayton Power & Light Co., he has been in the contracting business for the past four years.



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Core and coil assemblies of Wagner unit substation transformers are designed by experienced engineers, and built and tested by skilled workers. Highest quality materials are used throughout, and meticulous attention to detail marks each step in their construction.

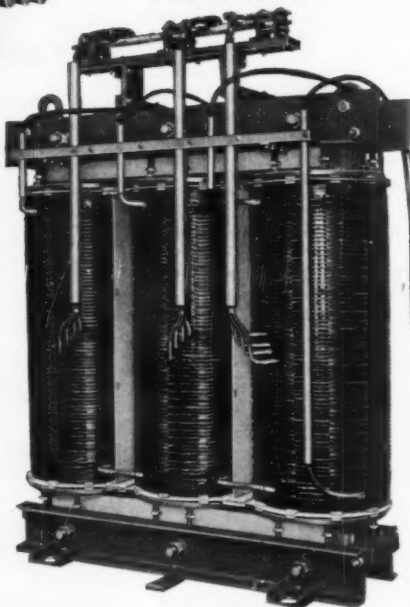
The transformer is the vital part of a load center distribution system. If the transformer fails, the entire system is dead whereas only part of the distribution system is affected by the failure of a switch or circuit breaker.

You can be sure of a dependable continuous flow of power from a Wagner transformer and you can be sure that it has been carefully designed to meet your distribution requirements.

Wagner unit substation transformers with incoming high voltage switch sections to meet your requirements, and with proper throats on the secondary side to connect to any make of switchgear, are available in the usual range of ratings up to 2000 kva. Our factory-trained sales engineers are well qualified to recommend the various combinations necessary to handle your unit substation requirements and they will be glad to give you immediate service.

Wagner unit substation transformers have been installed in all kinds of industrial plants including synthetic rubber, petroleum, steel, chemical, aircraft, automotive, paper, and many others. The importance of the transformer in a unit substation justifies calling in the Wagner sales engineer to help solve your load center problems.

Bulletins TU-13 and TU-56 describe the design and construction features that make Wagner liquid-filled and dry-type unit substation transformers outstanding.



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Reader's Quiz

Testing Ignitron Tubes

QUESTION—How can ignitron tubes which are used for spot welding be tested?—H.S.

ANSWER to H.S.—The answers are as follows: (1) They can be checked best by observing the tubes under operating conditions. This will only serve the purpose of telling whether the ignitor is completely burned off or not. If the ignitor is completely burned off, there will not be the distinctive bluish glow associated with this tube under operating conditions. (2) A loud growl usually indicates a tube grounding out due to water or some other conducting material coming in contact with the tube case. If this is not the case, then either one or both tubes are bad. (3) The resistance method is also used for testing these tubes. Touch one ohmmeter lead to the cathode of the tube and the other to the ignitor lead of the tube. If this resistance falls below 20 ohms, I would suggest replacing the tube or tubes. Disconnect the power from the tube and also the anode lead from its connected load and also remove the ignitor lead from its terminal connection in the contactor box. (4) Periodic resistance checks of ignitron tubes in the manner described above will tell just when these tubes should be replaced.—L.C.D.

ANSWER to H.S.—Ignitor-cathode resistance may be measured with an ohmmeter; with the power supply turned off the tube is allowed to cool to room temperature or to the temperature of the cooling water. With the tube in its normal vertical operating position, the ignitor lead is dis-

connected, and the resistance is measured with the ohmmeter between the ignitor lead and the tube cathode connection. If the resistance is less than 5 ohms or more than 150 ohms, the ignitron, and possibly its firing tube, as well should be replaced. With the ohmmeter connected, the ignitron should be tapped. There should be no intermittent readings of either zero resistance or infinite resistance on the ohmmeter. To test for foreign gases, use a high voltage spark coil capable of jumping a spark a half to three-quarters of an inch in open air. First, disconnect the anode terminal or lead of the ignitron and bend it so that the end comes to within one inch of the outside of the steel jacket of the tube. Touch the coil tip to the anode cable. There should be no sparks, and no pink or orange glow, inside the tube. Now press the coil tip against the anode lead to lessen the gap between the anode terminal and the jacket of the ignitron. A spark should jump across this gap before the space is reduced to as little as 3/16 inch.—H.C.M.

Brushes

QUESTION—Perhaps some of the readers could tell me why the pigtails come out of the brushes and the brushes get so fast in the holder that the spring has no action on the brush. This is on a dc generator driven by an ac induction motor. This is a reconditioned MG set.—A.F.L.

ANSWER to A.F.L.—The trouble could be a poorly constructed lot of brushes, or commutation troubles. Commutation troubles could be from many causes, but the first to look for would be an error or omission in the reconditioning job. Analyze the motor with instruments, and if this shows nothing unusual, try to cut down armature reaction by moving the brushes at a different angle with the fields.

See that the brushes have sufficient space in the holders in all positions of the brush. Also, look for a hard spot on the commutator end of the brushes, and with a piece of the finest (ordinary) sandpaper around the commutator, shape the end of the

brush to fit the curve of the commutator.—M.C.T.

ANSWER to A.F.L.—Most brushes with pigtails are properly set and with difficulty can be separated. The reason why pigtails come loose is that they are set together in too much of a hurry when manufacturing them.

The best way is to get a set of brushes that are loose at the pigtail contact, and heat to a 400° F heat so that a bit of solder may be put into the entrance where pigtail enters the carbon brush. When cool, check if still loose; if so, try to punch the solder into the recess of the brush, but do it gently, as the over packing will crack the carbon.

When brushes stick in its holder, press the carbon down, including the corners by sanding them somewhat round on the edges. Be sure the holder is smooth and not pitted.

Try to change the angle of the brush holder to the commutator so as not to hinder the commutation on the armature. Keep the motor well covered and free from grit and dirt. The spring used behind the brushes should be reset to have the proper pressure applied to the center of each brush.—O.C.

Commutation Trouble

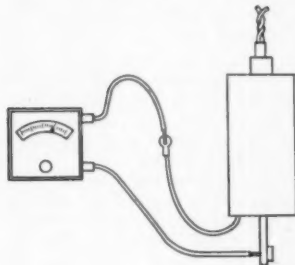
QUESTION—We have a Crocker Wheeler 75 hp dc motor driving a coal pulverizer. This motor draws 200 amps and is rated at 265 amps.

We have constantly experienced some commutation trouble. We use factory made reaction brushes. We have also had this motor in the best motor repair shop in this area to be checked.

Now, nine months after the last check-up, some of the commutator bars are again black, while adjacent bars are bright.

Is it possible to correct this trouble, or would the hardness and softness of the different commutator bars cause this trouble?—L.A.H.

ANSWER to L.A.H.—I had a similar experience a short time ago. I did everything until I discovered that the large drive belt was causing a back feed which in turn was opposing the



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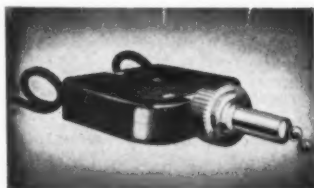
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The small, compact size of the Model 41 makes it ideal for use in modern lighting fixtures and canopies, as well as for FHP motor control.



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commutator of this d-c machine. I remedied this by the replacement to V belts and made the distance from motor to equipment very short.—V. P.

ANSWER to L. A. H.—The black bars on a commutator generally denote trouble in the immediate coil connected to that bar but, as the type of winding was not mentioned, it is difficult to definitely state the trouble. As the motor is pulling 65 amps short of its rating, it is apparent the trouble is introducing some .32 percent added resistance. If it is an undercut commutator, the slots could fill with carbon and short-circuit coils, or reaction brushes could do this. Internal insulation breakdowns of 2 or more coils, if at all equidistant, are also very deceptive.—J. V. H.

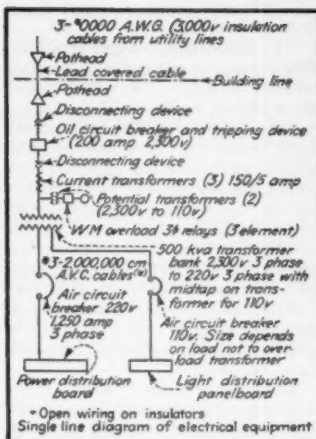
ANSWER to L. A. H.—If the dc motor referred to in this question is run continuously for nine months without stopping, that would be proof enough that the commutator bars are of different hardness. But if the motor is used periodically, starting and stopping, then you can expect to find blackened commutator bars from the effect of the starting load. This has a tendency to leave a deposit on the commutator bar under the brush, when the current is applied on a motor at a standstill. Larger motors have a tendency to stop with the rotor or armature in the same position every time. This causes additional arcing on same commutator segment, which in time will recess a little lower than the adjacent segments, and not be of the same color. An easy remedy is to purchase a commutator dressing stone and use it periodically.—E. S. H.

Service Design

QUESTION—How do I go about designing a 500 kva service? I start at the utility lines which are 2300 volt, 3 phase, 3 wire and wind up at distribution panels at 220 volts, 3 phase and 110 volt, 1 phase. How do I determine size and location of P. M. meters, potheads, C. T.'s, etc.?—A. S.

ANSWER to A. S.—Install 3 conductor 2300 volt cable (3-#0000A.W.G.) from utility 2300 volt, 3 phase lines to a 3 phase oil circuit breaker rated to carry 150 amperes continuously and break this circuit intermittently as required and also able to break any short circuit current without injuring the oil circuit breaker.

A set of current and potential transformers will be required for metering and overload relay protection and tripping oil circuit breaker. On the secondary side, install 1-1250 amp air



circuit breaker with overload trip coil and also 1 air circuit breaker (110 volt 2 pole) for lighting with automatic overload protection. If all the high tension equipment is in the same compartment or room, the only potheads required will be at the utility company lines and just ahead of the 2300 volt disconnecting device.

Determine the load center and try to locate your equipment there or as near as possible. It is advisable to keep the high and low tension in separate rooms, properly ventilated and made of material resistant to fire. In the older installations, the transformers and switchgear are generally located in the basement just where the service enters the building. If the power is being purchased, high tension without meters, relays, demand meters, etc., will be in the high tension room.—E. B.

ANSWER to A. S.—There are many methods that can be used in designing a 500 kva. service and the method selected would depend on local conditions. A typical service of this size would consist of three parts; an outdoor substation, an indoor disconnect cubicle, and an indoor distribution system.

The outdoor substation would consist of a 3 pole, 5 kv, 400 amp outdoor disconnect switch, three 5 kv fuse cut-outs, three 5 kv lightning arrestors, and three 167 kva single phase power transformers. This provides a low voltage secondary service to enter the building and a standard conduit installation can be used.

Inside the building the service enters a circuit breaker cubicle which acts as the main disconnect. The cubicle is standard equipment and comes complete with circuit breaker, potential and current transformers, meters, busbars, etc. The manufacturer

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TOLEDO 1R THREADER

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Simple in design with one ratchet handle.

Do your next 1" to 2" pipe work with a Toledo 1R Threader—the tool that's "tops" with better mechanics! Similar to the famous No. 1 and No. 1A Toledos—but *simpler in design* with one ratchet handle and *low in cost!* A separate set of dies for each size of pipe—1", 1¼", 1½" and 2"—assures longer die life. Each set is hobbled for just the proper clearance. This means easier cutting, smoother, cleaner, more perfect threads and tighter pipe joints! Die change is quick and easy... or, many users prefer separate tool for each size. Durable... saves job-time... reduces costs! Ask your distributor for details and price... or send coupon.

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Unit-built for safe, easy use, Milwaukee HOLE-SHOOTERS are the only "Right-angle" electric drills that give you 3 speeds for a variety of applications.



UNMATCHED for accuracy, time-saving, and speedy performance in close quarters, this remarkable new tri-speed HOLE-SHOOTER is the choice of electricians everywhere and a sure profit-builder for electrical contractors. It has no equal for speeding-up construction work and maintenance in industrial plants.

Adaptable to easy, usable positions, even in the tightest corners, this tool provides the most suitable speeds for boring with bits of every size, including expansive bits and hole-saws. Also suitable for drilling in steel and concrete.

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- 3 3 special bits for boring in wood—3/4", 1 1/8" and 2 1/8".
- 4 Special wrench for attaching and adjusting "Right-Angle-Drive" and Chuck.

\$87.00

Adjustable "Long Arm" Accessory...
\$24.50 EXTRA *Pat. Pending



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will provide all data necessary to go with the cubicle.

The distribution of power in the building can be accomplished by using either a bus duct or load center system. Both systems would distribute 3 phase power at 220 volts. The single phase loads would require transformers to give 110/220 volts and placed as near to the load as possible. If a bus duct system is used, plug-in circuit breakers or fuses are used to connect motor and lighting loads. If a load center system is used, a power distribution panel will be required at the cubicle with feeders running to the load centers. If there is a heavy motor load, it may be wise to provide capacitors for power factor connection.

The designer should consult with the local utility company to determine what their requirements are for metering, power factor correction, motor starting, etc.—J. H. C.

Governor Spring

QUESTION—We have a 230 volt, 1 1/2 hp Westinghouse motor on a refrigeration compressor that heats the governor spring on the throw-out fingers until they break. Why? The motor is not overloaded, and runs cool at all times, and is protected by a thermal guard.—D. S.

ANSWER to D. S.—I would expect to find trouble in the contacts of the short-circuiting fingers. If they offer resistance while running in the high-speed position, the spring might be acting as a shunt to the fingers, and taking some of the current. Since spring steel is of higher resistance, a good deal like a heating unit, the heat could burn it off, especially on its points of contact with a different kind of metal.—M. C. T.

ANSWER to D. S.—Apparently, this motor is of the dual cycle (50-60) and dual voltage design, with the motor coils connected 230 volt on a 208 volt service line, such condition is not adaptable for refrigeration and D. S. would fare better to reconnect the motor to 115 volt, changing the service line connection to 120 volt (erroneously called 110 volt). Of course, there are possibilities to rectify the motor problem mechanically and/or electrically in the refrigeration system, which, however, is sometimes very time-consuming and expensive; therefore, if D. S. does not obtain the result by reconnecting the motor to 115 volt, the best advice then is to replace this motor with a 220 volt 110 volt repulsion start and induction run motor, either of the brush riding or brush lifting type, which would save him many headaches thereafter.—C. B.

Can you ANSWER these QUESTIONS

QUESTION F17—We are installing a 3 conductor No. 00—3000 volt insulation Neoprene type power cable in a mine tunnel—3850 ft. from portal to inside station. This cable is to carry 2300 volts. Already installed and in use for several years is a No. 6—3 conductor 3000 volt insulation cable with varnished cambric insulation, a lead sheath and a spiral steel ribbon protective wrapping. The distance between the two cables is approximately 3½ ft.

Would we be able to phase these cables out and tie them in parallel and would they each pack their rated share of the load? There are no air pipes or other metal lines, except messenger cable within 6 ft. of either cable.—D. M.

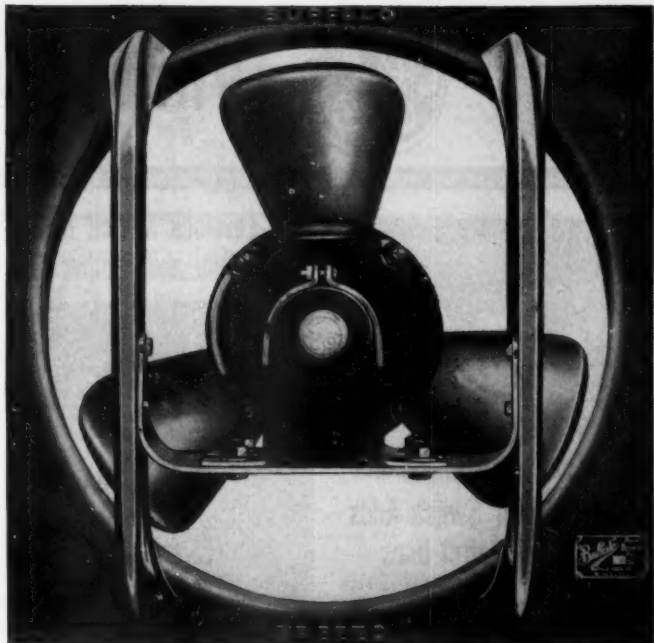
QUESTION G17—We want to wind some 110 to 32 volt 200 watt insulating transformers for use with extension cords in wet locations. Can you give a formula for the iron, wire size, etc?—W. P. R.

QUESTION H17—We have two identical fan installations in which both fans are driven by 15 hp., 3 phase, 220 volt motors and V-belt drives. Both motors are of the same manufacture and wired correctly with all necessary protection and controls and with three No. 6 wires not over 50 feet from a circuit breaker type distribution panel.

Circuit breakers used for branch circuit protection are of 70 ampere capacity, yet the ampere reading of one motor is 40 amperage and of the other motor 44 amperage per phase. However, our main trouble is that both the wiring and conduit for the motor drawing 44 amperage are overheating and continuously warm. Also, the branch circuit breaker on this particular motor will always trip and not allow the motor to be started more than once within intervals of 20 or 24 minutes. Changing breakers has no effect on this.

We are under the impression that there is an incorrect connection within the motor, causing a stray or reactance current to be set up in the circuit wiring which, in turn, is the cause of this wire and the conduit overheating between the panel box and the motor but would like to receive other opinions before complaining to the manufacturer.—J. L.

PLEASE SEND IN
YOUR ANSWER BY OCT. 15



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WIRING NEWS

A PERIODICAL DIGEST OF WIRING IDEAS FROM THE GENERAL ELECTRIC CONSTRUCTION MATERIALS DEPARTMENT



Master Selector Switch Adds New Remote Control Uses

Have you stopped to consider the amazing versatility added to General Electric's remote-control wiring system by the master selector switch?

Replacing gangs of separate ON and OFF controls, the compact master selector switch, RMS-1, provides instant, positive control of up to nine different circuits.

You'll do well to use it as an added talking point in arousing *even more interest* in remote control. Be sure to show your customers how one or more master selector switches can provide them with advantages such as these:

In Homes and Apartments

Instant bedside control of all interior and exterior lighting . . . an invaluable asset in emergencies. Added convenience through control of kitchen appliance outlets and attic ventilators from several different points. Control of key indoor and outdoor lights from the garage, front door, back door, and bedroom.

In Plants and Factories

Control of fire and alarm circuits. Control of watchman's circuits and provision for pathway lighting on his rounds. Selective control of aisle lights, individual work area lights, outlets, and small electrically-operated machinery from any desired point.

Then too, there are many applications for farms, swimming pools, parking lots, athletic fields, tourist cabins, schools, museums, hospitals — and you can probably think of many more. For further information simply check box (A) below.

New Levelock Switch Box Saves Time and Temper



Neither hammer blows nor construction-site abuse can dislodge the side plates of the new General Electric Levelock switch box. Wedging action of a new locking mechanism locks box parts securely in place — yet is simple enough to permit fast, certain assembly of switch-gangs.

Leveling the box against the studding is also a faster, easier operation. Four contact points — instead of the usual three — prevent tilting or rocking of box during nailing.

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A new single-screw ear adjusts from slightly above to $\frac{3}{8}$ -inch below the edge of the new Levelock box, while an extra-sturdy bridge across the ear adds increased strength. There's plenty of space, too, within the bridge to accommodate the device strap.

The ingenious construction of General Electric's Levelock switch box makes possible immediate installation savings on either new construction or modernization work. Prove it to yourself — plan to try the new Levelock on your next job, or check box (B) in the coupon for complete information.

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(†U. S. Patent No. 1,954,481)

Section K13-918

Construction Materials Department, General Electric Company, Bridgeport 2, Connecticut

- ☐ A—Remote-control Master Switch
- ☐ B—Levelock Switch Box
- ☐ C—Versatol-Geoprene Trench Cable
- ☐ D—Hung Ceiling Box

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GENERAL  ELECTRIC

F. N. M. SQUIRES
Chief Inspector
New York Board of Fire Underwriters
New York, N. Y.

and

Answered by
GLENN ROWELL
Electrical Engineer
Fire Underwriters Inspection Bureau
Minneapolis, Minn.

and

B. A. McDONALD
Chief Inspector
New York Board of Fire Underwriters
Rochester, N. Y.

Questions on the Code

Service Equipment

Q. A four-family apartment building is supplied through a four gang meter trough, mounted outside on the wall and subsets of service entrance cable, are run to the individual occupancies.

Does Section 2351 require that the four disconnecting means be grouped or may each individual apartment contain its own disconnecting means and no other disconnecting means be provided near the meter trough or elsewhere?—G.T.D.

A. If the four service entrance cables run from the outside meter trough along the outside of the building to each apartment, the individual service switches may be located in the individual apartments at the point of entrance of the cables to the apartments and no other disconnecting means would be required at the meter trough or elsewhere.—F.N.M.S.

Wiring

Q. Will Type TW wire in conduit under a gasoline filling station driveway be accepted by the Code?—H. A. S.

A. The Code under Section 5142 d. reads as follows: "Conductors in conduits entering or leaving dispensing pumps when covered with a rubber compound or other compound upon which the dispensing liquid will have a deleterious affect must be sheathed with a suitable material such as lead." Type TW insulation will be affected by gasoline; therefore, technically the Code does not accept Type TW insulation. However, in climates where such conductors would be subject to freezing temperatures, a lead sheathed conductor as required by this section of the Code will not withstand freezing weather and will give a shorter life, as a rule, than a Type TW insulated conductor and, therefore, many filling stations have been wired with Type TW wire which has given a satisfactory service when compared with the life of other conductors previously available. Now there is, how-

ever, a new conductor available having an exterior extruded jacket of nylon which may be used within such raceways and upon which gasoline apparently has little or no effect. This new nylon jacketed conductor is now being manufactured by at least two of the wire mills, one being the U. S. Rubber Company and the other being the Anaconda Wire & Cable Company.—G. R.

The 25-Foot Tap Code Provision

Q. The engineer planning the wiring of a new wing to a school building desires to eliminate the use of panelboards for the branch circuits and substitute the application of Section 2434 d of the Code in the following manner.

He plans to run three phase, 4 wire, Y connected feeders consisting of 4 type RH conductors which have a carrying capacity of 65 amperes per phase to ground.

These feeders would consist of conduit running down and behind the ceiling of the corridors. Opposite to the entrance of a class room he proposes to tap the feeders with No. 10 conductors and run direct to a 3 gang box containing a 3 phase 15 ampere branch circuit, circuit breaker which would provide three circuits per class room. The tap to the circuit breakers would be less than 25 feet long and the breakers would serve as manual disconnects for each circuit. Would there be any Code violation with such a proposal?—L.F.

A. It appears from the information given that the above proposal satisfies the requirements of Code Section 2434 d which permits 25 foot unfused feeder taps provided the tap has a current carrying capacity at least one-third that of the feeder, is protected from mechanical injury, and terminates in a single circuit breaker or set of fuses which limits the load to the current carrying capacity of the tap. Note, however, that only one circuit breaker could be used and not individual circuit breakers for each

circuit. It is my opinion, however, that the proposed application greatly exceeds any intent of the sponsors of this Code provision when the rule was originated. It also appears that other Code provisions are involved such as the junction box where the tap is made. This box must be accessible. In school construction today this would be difficult to satisfy unless the box was flush with the ceiling finish which would result in an undesirable and unsightly ceiling. It also follows that special attention must be given the method of connecting a No. 10 conductor to a 15 ampere breaker. It also follows that the desirable feature obtained by the use of a panelboard which ordinarily limits the fault on a circuit to the circuit would be sacrificed. It is quite possible that a circuit fault under the proposal would open the feeder overcurrent device and cause several class rooms to be involved. I also question any economy by such procedure.

The fact remains, however, that if all of the Code provisions of 2434 d as well as other pertinent requirements are satisfied this proposal would satisfy the requirements of the Code.—B.A.McD.

Conductors

Q. If the total connected load on a building is such that it will require the use of 500,000 C. M. conductors, is it possible to use six 4-0 conductors in place of the three larger ones as we find it much simpler to pull the smaller conductors through a rather long service raceway than the larger ones?—M. C. K.

A. Yes, the Code under Section 3105 permits the running of conductors in multiple in sizes 1-0 to 500,000 C. M. inclusive, provided they are of the same length and have the same circular mill area and type of insulation. Not more than three No. 1-0 or four No. 2-0 or five No. 3-0 to 500,000 C. M. conductors inclusive may be run in multiple except as herein provided, conductors shall be run in multiple only by special permission or



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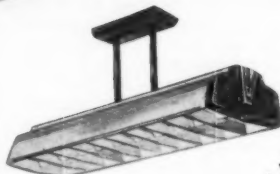
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as permitted in Section 6205. Where conductors are run in multiple, they shall be arranged and terminate at both ends in such a manner as to insure equal division of the total current between all conductors that are involved. There is one more requirement of the Code which must be considered and that is the allowable current carrying capacity of conductors within conduit and under Table No. 1 of the National Electrical Code you will note under Note 4 that where more than three conductors are contained within the raceway, the allowable current carrying capacity must be reduced. If the number of the conductors in the raceway is from four to six, the allowable current carrying capacity for each conductor shall be reduced to 80% of the values shown in Table 1, and if the number of the conductors in the raceway is from seven to nine, the allowable current carrying capacity of each conductor shall be reduced to 70% of the values shown in Table 1. Therefore, in your particular case it will be necessary to reduce the carrying capacities for the six conductors to 80% of that shown or if Type R insulation is used, this would indicate that the total capacity of two No. 4-0 conductors would be reduced to 312 amperes instead of the 320 amperes permitted for Type R in the 500,000 C. M. size. Therefore, it is often necessary to use the Type RH conductor where the conductors are run in multiple or to run the multiple conductors in separate conduits. However, when that is done, it becomes necessary to place a conductor for each phase or leg used in each conduit so that the loads in each conduit will be identical.—G. R.

Proper Use of Outlet Boxes

Q. I recently received a rejection from the inspector because I used the side K.O. holes on a one and one half inch deep octagon box. The wiring method used was non-metallic sheathed cable and was installed in a new house. The inspector told me to use the back K.O. holes. Where does the N. E. code cover such an order? —W.McD.

A. It is evident from your question, that you were installing the "rough wiring" on a new house where the finished wall and ceiling surfaces were to be installed after inspection. Under such conditions a one and one half inch deep box does not permit the use of the side K.O. holes without subjecting the cable and

the fitting to severe injury when the carpenter applies the wall finish. While the Code does not specifically cover such a condition, Section 3003b of the Code would apply. This Section requires conductors subject to mechanical injury to be adequately protected. In line with this general requirement I believe the inspector is justified in his request that the back K.O. holes be used, when rough wiring, which is to be concealed, is installed and one and one half inch deep boxes are used. —B.A.McD.

Disconnecting Means

Q. A three-phase branch circuit to a compensator and a 10 horsepower motor originates at a "swing-out" (not horsepower rated). The panel "swing-out" is within sight of the motor. Do we need to place a horsepower rated switch between this panel and the compensator?—J. F.

A. Yes, Section 4402 of the Code is very definite in requiring that the disconnecting means shall be a motor rated switch or a circuit breaker except as provided in the following paragraphs A, B, C or D and under these provisions you will note no exceptions which will permit the use of a "swing-out" at the panel that was not horsepower rated.—G. R.

Lightning Rod Conductors

Q. During the past month I have criticized three installations of lightning ground conductors that are run down the side of the building within a foot or two of the service entrance cable which supplies the building. The occupancies are dwellings on farm properties and the services are 3 wire, 115-230 volts. Do you believe that Section's 2534 and 2546 justify my criticism?—D.S.

A. Section 2534 of the Code specifically covers metal enclosures of conductors. In view of the fact the service cable is the wiring method it appears that this rule does not apply. In view of the fact, however, that service cable with a bare ground conductor woven around the live wire assembly presents a hazard somewhat similar to that presented by a metal conductor enclosure, it appears on the basis of hazard that the rule should apply.

Section 2546, however, definitely requires metal frames and cases of



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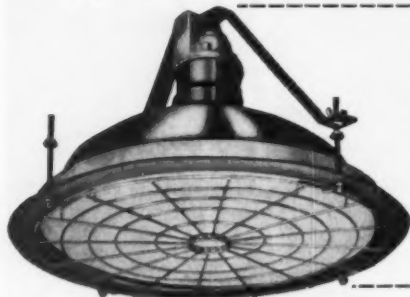


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Reflector is steel, porcelain enameled and is removable from the cast aluminum socket fitting. The latter is tapped at side for 1/2-inch connectors for rigid or flexible conduit. All units are complete with heavy tinned wire guard and may be ordered with or without glass covers. Also included are necessary nuts and bolts for attaching to ceilings of various thickness up to three-inch maximums.

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electrical equipment where practicable to be kept six feet away from lightning rod conductors. If not practicable they shall be bonded together. If the lightning conductor ground comes within six feet of an outside meter cabinet the rule applies. If the lightning conductor comes within six feet of any metal frames of electrical equipment located on the inside wall of the building the rule as it reads likewise applies. I believe your criticism is justified in line with Section 2546 even though it is questionable with Section 2534.—B.A.McD.

Why the Large Fuse Blew

Q. I recently made a repair of a fault on a 15 ampere circuit, which blew the 100 ampere feeder fuse but did not blow the 15 ampere circuit fuse. How could this happen?—A.P.P.

A. Such a condition usually results when the feeder is greatly loaded and its fuse has reached the point where any small additional load will cause it to open immediately and before the branch circuit fuse reaches a temperature that would cause it to open the circuit. It also follows that if the feeder fuse has poor contacts or is part of a switch in bad condition, either one causing heat, that when a fault occurred on the branch circuit the feeder fuse might respond to the current inrush faster than the branch circuit fuse.—B.A.McD.

Wiring in Hospitals

Q. We are installing the electrical wiring in a new hospital building which is of steel bar joist construction and are at a loss as to the proper means of supporting the surgical lamps in the operating rooms. As you know, these fixtures weigh considerably over the 50-pound limit as shown in the Code and, therefore, require independent support of the outlet box or bar hanger. Now we have been given to understand that this fixture must be isolated from ground and inasmuch as the steel frame of a building is grounded, we are at a loss as to the means of providing support for an all metal fixture under such conditions. Is it true that the Code will require that this fixture be isolated from ground?—G. C. R.

A. At the present time the National Electrical Code actually requires that a fixture within reach of

HOW to Centralize

Your Motor Controls

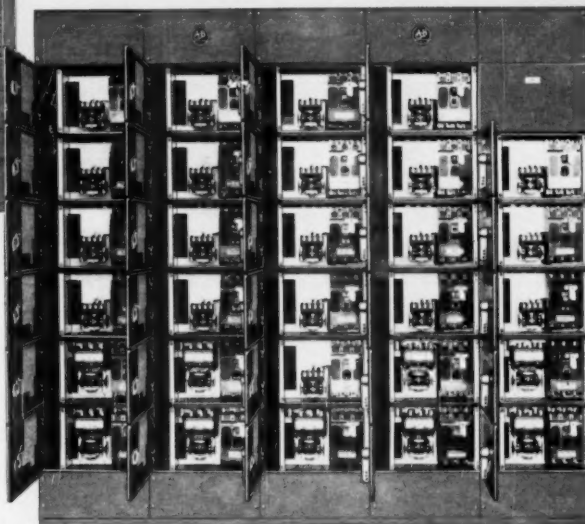
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- Reversing—fusible—with disconnect switch.
- Reversing—with circuit breaker.
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- Multispeed—with circuit breaker.

Other Control Units

Reduced voltage—autotransformer starter—with circuit breaker.

Main incoming line circuit breaker or disconnect circuit breakers or fusible disconnect switches for feeder circuits, lighting panels, and transformers.

Accessories, such as push buttons, selector switches, pilot lights, auxiliary contacts, control relays, control transformers, and special assemblies.

Individual vertical sections consist of flanged side plates rigidly joined by cross member. A 4-inch wireway runs vertically through each section and connects with bus bars at top of section.

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330M



ALLEN-BRADLEY

BULLETIN 798 MULTI-UNIT CONTROLS

QUALITY



ALLEN-BRADLEY MULTI-UNIT CONTROLS

are quickly adaptable to plant changes

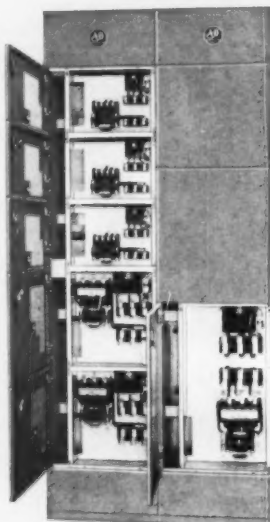
Bulletin 798 Plug-In Control Centers are provided with connection clips, attached to the back of each control unit, which slide over the vertical bus bars that rise behind the individual unit sections. Contact is maintained with spring clips. Any sectional unit can therefore be withdrawn or shifted to another position. A new type of unit can be slipped into its place. Thus, the Allen-Bradley Multi-Unit Control is always ready for any plant change.

The various vertical sections can be arranged to fit any room or floor plan.

- Fit any floor arrangement
- No special supports required



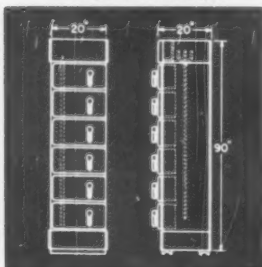
Changing a Multi-Unit section is a simple job when the Allen-Bradley plug-in construction is used. Changes are easily made to fit new plant requirements.



Two section Control Center with Sizes 1, 2, & 3 Switches and Disconnect Units.

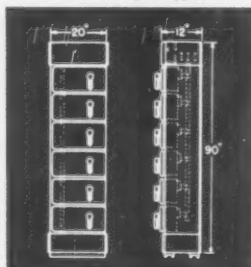
MULTI-UNIT PANEL DIMENSIONS

Fixed Connection Type



Vertical sections are 20 inches wide, 20 inches deep, and 90 inches high. White interiors make inspection easy.

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SOLENOID MOTOR CONTROL
QUALITY

grounded materials or devices be grounded and also that a fixture supplied by a metallic raceway be grounded or that a fixture on a metal lath ceiling be grounded. However, in a hospital operating room, standards governing the use and installation of electrical equipment in rooms in which combustible anesthetics will be used require that the fixtures and wiring be isolated from ground. Therefore, while this is not a National Electrical Code ruling, it is a ruling of the National Standards governing the electrical installations in rooms in which combustible anesthetics will be employed. In several instances in this area, hospitals constructed of bar joists have employed wood members between the bar joists for the support of these surgical lamps and in this way have accomplished the isolation from ground of the lighting fixture.—G. R.

Uninsulated Grounded Service Conductors

Q. The outside, overhead distribution system of the electric utility consists of a three phase, 4 wire Y secondary giving 208 volts between the phases and 120 volts from each phase to the grounded neutral conductor. Under these conditions will there be any Code violation if I install a three wire single phase service with a bare ground wire and connect it to such a distribution system?—A.B.

A. This is in violation of Section 2303 A which permits a grounded Neutral conductor to be used on the service without an insulating covering. Reference to note No. 5 following Tables 1 and 2 of the Code calls our attention to the fact that a 3-wire circuit consisting of two phase wires and the neutral of the 4 wire, 3 phase system, is not a balanced circuit and the ground wire is not a neutral conductor. As a result the use of service cable with an uninsulated ground conductor would be in violation of Section 2303 A. The same holds true for services installed in raceways.—B.A.McD.

Carrying Capacity Of Conductors

Q. The following question came up during a discussion of the Code at one of our Code sessions and we would appreciate receiving your idea as to the intent of the Code concerning it. In a building served by a three-wire 110-220 volt service, we have a conduit which contains a three-way switch

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No. 2905, 7/8" offset hanger,
18". No. 2905-A, 25 1/4".

No. 2913, 1 1/2" offset hanger,
18". No. 2913-A, 25 1/4".

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No. 2910, 1 1/4" box
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No. 1900, 18" straight hanger.
No. 1900-A, 25 1/4".

No. 1904, 1 1/4" offset
hanger, 18".
No. 1904-A, 25 1/4".

No. 1905, 1 1/4" offset
hanger, 18".
No. 1905-A, 25 1/4".

No. 1913, 1 1/2" offset
hanger, 18".
No. 1913-A, 25 1/4".

No. 1917, 1 1/2" universal "S" hanger.
No. 1917-A, 22 1/4".

No. 910, 1 1/4" box
cleat hanger,
21".

No. 920, 12" old work
hanger.

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loop and a three-wire multi-wire circuit or in other words, the conduit contains six conductors. Now our question is, does the Code require that the carrying capacity of the conductors in such a conduit be reduced by 80% as shown in Note 4 following Table 1?—O. C. S.

A. In this Note 4 you will note that a neutral conductor which carries only the unbalanced current from other conductors as in the case of normally balanced circuits of three or more conductors shall not be counted in determining current carrying capacities as provided for in the preceding paragraph. Therefore, the neutral conductor used as a common conductor for the multi-wire circuit may be ignored and one of the switch leg conductors used in the three-way switch loop may be ignored as only one of these conductors can carry current at any one time. This, however, leaves us with four current carrying conductors; therefore, it becomes necessary to use the 80% rule as contained in Note 4 following this Table No. 1. One should remember that a neutral which carries the same load as one of the ungrounded conductors in any raceway must be counted as a current carrying conductor but the neutrals which carry only the unbalance of load need not be so.—G.R.

Official NEC Interpretations

INTERPRETATION NO. 351

Issued May 5, 1950

Section 4003

STATEMENT: An "electric dryer" (domestic laundry type) rated 4600 watts, 115-230 volts, includes heating units at 230 volts, also a timer, a fractional horsepower motor and inside lighting fixtures at 115 volts. Its weight (235 pounds) and dimensions (36 by 31 by 27 inches) allow it to be moved readily. Servicing, cleaning, etc., make it desirable to provide a flexible or detachable supply connection. An owner may wish to continue its use if moving to a "new home." No fixed plumbing for water supply or discharge is involved.

QUESTION: May such an appliance be supplied from a suitable branch circuit (three-wire) in accordance with section 4003 (3) and the definition (Article 100) of a portable appliance?

ANSWER: Yes.

INTERPRETATION NO. 355

Issued May 8, 1950

Section 2403—Table 1

QUESTION 1: Is it the intention of the Code that Table 1 permits six 115-volt branch lighting circuits derived from a 3-phase, 4-wire supply

and comprising a total of eight No. 12 conductors to be run in a single conduit?

ANSWER: Yes.

QUESTION 2: In view of the reduced allowable current specified in Table 1 (Note 4) for the conductors installed in this single conduit, may single pole non-adjustable circuit breakers, rated 20 amperes, be chosen as the overcurrent protection specified in paragraph b, section 2403 of the Code?

ANSWER: Yes.

INTERPRETATION NO. 356

Issued May 24, 1950

Section 2403

QUESTION: Is it the intent of the National Electrical Code, 1947-9 edition, that the exceptions allowed in paragraphs a, b, and c of section 2403 be likewise accepted when there are available appliances (fuses or circuit breakers) with standard ratings corresponding to those of Table 1 for the conductors under consideration?

ANSWER: No.

INTERPRETATION NO. 353

Issued May 24, 1950

Section 2351-a

Section 2371-a-3

QUESTION: What is the intent of the limit of "six" specified as to disconnecting means, section 2351-a and overcurrent protection, section 2371-a-3, of the 1949 edition of the National Electrical Code?

ANSWER: To accomplish complete control and interruption of current supplied through a given set of service entrance conductors.

INTERPRETATION NO. 354

Issued May 24, 1950

Section 3709

QUESTION: Does paragraph "b" of section 3709 recognize the use of extension ring with a standard outlet box in order to secure additional capacity within the box assembly for a larger number of conductors than is specified in paragraph "a" for the corresponding trade-size box?

ANSWER: Yes.

INTERPRETATION NO. 357

Issued June 23, 1950

Section 2116-2203-b

Show Window Lighting

QUESTION: Was the relief provided in the case of show windows in small stores, and served from lighting branch circuits, permitting acceptance of the one and one-half ampere rating for outlets provided for the show window lighting in contrast to the formerly recognized factor of 200 watts per linear foot intentional?

ANSWER: Yes, assuming that the provisions of section 2203-b are taken into account in computing feeder loads.

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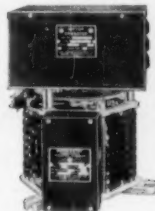
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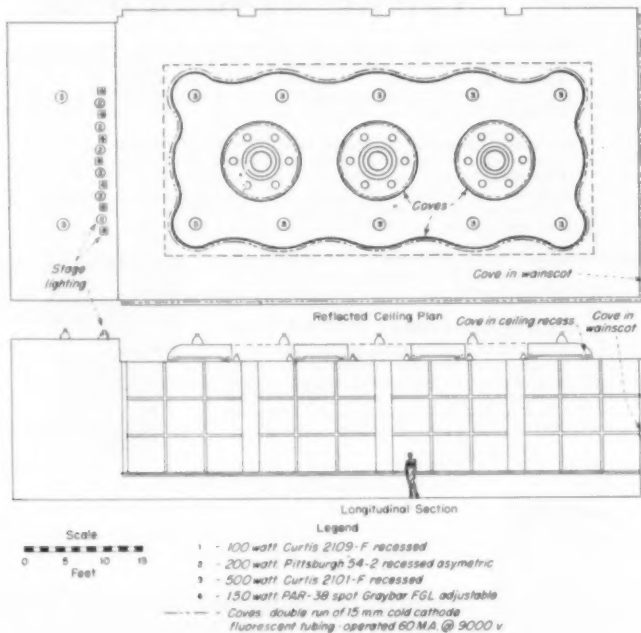


POWERSTAT VARIABLE TRANSFORMERS • VOLTBOX A-C POWER SUPPLIES • STABILINE VOLTAGE REGULATORS

Modern Lighting



COVE LIGHTING around borders of dropped ceiling areas, and ceiling-recessed downlights provide range of intensities between 6 and 25 footcandles for various effects. The stage (from where photo was taken) is equipped to provide 115 footcandles.



PLAN AND ELEVATION indicates positioning and scale of lighting equipment used in the seventh floor auditorium of the Life Insurance Company of Georgia.

Lighting Variety For An Auditorium

Several interesting lighting treatments are combined in the design of the auditorium of the Life Insurance Company of Georgia. These treatments, used in conjunction with tastefully selected drapes, blended color combinations and stage facilities for a wide variety of presentations, provide an attractive center for both social and educational gatherings.

The auditorium, measuring 80 by 37 feet with an 18-foot ceiling, can be lighted to several intensities for dancing by the controlled use of cove lighting and/or the recessed incandescent downlights in the ceiling.

Cove lighting, following the scalloped contour of the recessed ceiling panel, the peripheries of the three circular center panels, and the wainscot line on two sides of the room, provides 6 footcandles, while 25 footcandles are provided when incandescent units are in use. When stage presentations are desired, ceiling recessed asymmetric incandescent reflector units provide 115 footcandles on the stage area, and floor outlets are available for connecting strip footlights and special electrical effects. Exit lighting is separately circuited for safety. With auditorium and stage lighting controlled by two different panels, maximum lighting flexibility is obtained.

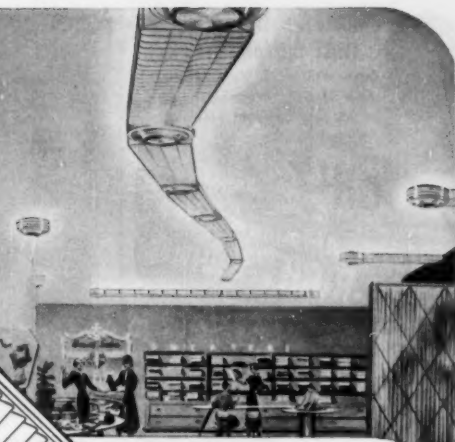
Incandescent lamps include 100-, 150-, 200- and 500-watt sizes. Coves consist of double runs of 15-mm cold cathode fluorescent tubing operating at 60-ma and 9000-volts. Ends are staggered, eliminating dark spots.

Color is used with pleasing effect; the border ceiling and dropped center panels being natural acoustical tile, the recessed plaster ceiling being white, the upper walls light oak, the lower wainscot dark walnut and the draperies containing grey, green and yellow.

All parties connected with the design and installation are from Atlanta; the electrical contractor being Bartenfeld Electric Company; the illuminating engineer being Jack H. Murrah of the Georgia Power Company; the architects being Bodin and Lamberson; and the luminous tubing work being performed by the Acme Neon Company. Incandescent equipment is by Curtis Lighting, Inc.; Pittsburgh Reflector Co., and Walker Electric Company.

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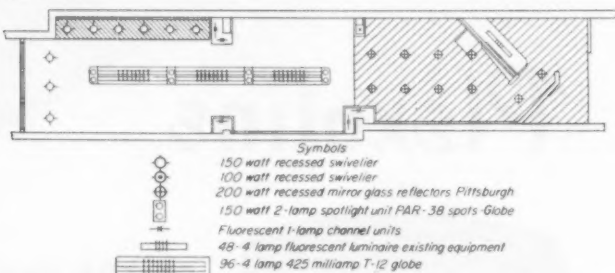
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LONG, NARROW shoe store achieves pleasing lighting results by using a wide variety of slimline, standard fluorescent and incandescent units to illuminate decorative treatments ranging from pink serrated plywood to knotty pine panelling.



TWO DEPARTMENTS for women and men, two ceiling heights, uneven floor plan and protruding structural columns called for ingenuity in selecting and installing lighting units to combine functional footcandles with pleasing results.

Footcandles For Footwear

The shoe store of S. Pagel & Son, Norristown, Pennsylvania, is an example of effective lighting in a hard-to-light long and narrow area. In fact, structural limitations also included protruding columns, an uneven floor plan and a two-level ceiling, all contributing to the difficulties of combining functional illumination with a pleasing lighting plan.

As indicated in the accompanying illustration, the store is divided into a Woman's and a Man's department, the one having pink and white serrated plywood sidewalls, the other being paneled in golden knotty pine.

To illuminate the women's department, five lighting treatments were used for general, accent, niche and mirror, soffit and down-lighting. General lighting is provided by three 8-foot 4-lamp T-12 Globe shielded luminaires mounted along the ceiling centerline and operating at 425 milliamps. Between these units and at the ends of the 3-unit run, 150-watt double PAR-38 spot units are installed for

accent purposes. Since these units can be swivelled in any direction, intensities can be built up on displays.

Niche and mirror lighting is fluorescent, with 18-, 24- and 30-inch lamps being used in single-row installations. Soffit lighting along the underside of the dropped ceiling consists of six 100-watt Swiveler units. Three other Swiveler units, lamped with 150-watt bulbs, are ceiling recessed above the front all-glass entrance.

General illumination ranges from 30 footcandles at side walls to 56 fc. directly under the slimline fixtures. Accent areas run between 140- and 160-fc. Display niches average 45 footcandles and, at the entrance beneath the three Swiveler downlights, intensities are 64 fc.

Three lighting treatments are used in the men's department for general, niche and cashier illumination. General lighting is provided by nine 200-watt recessed Pittsburgh mirror glass louvered reflector units, niche lighting is achieved by installing 15- and

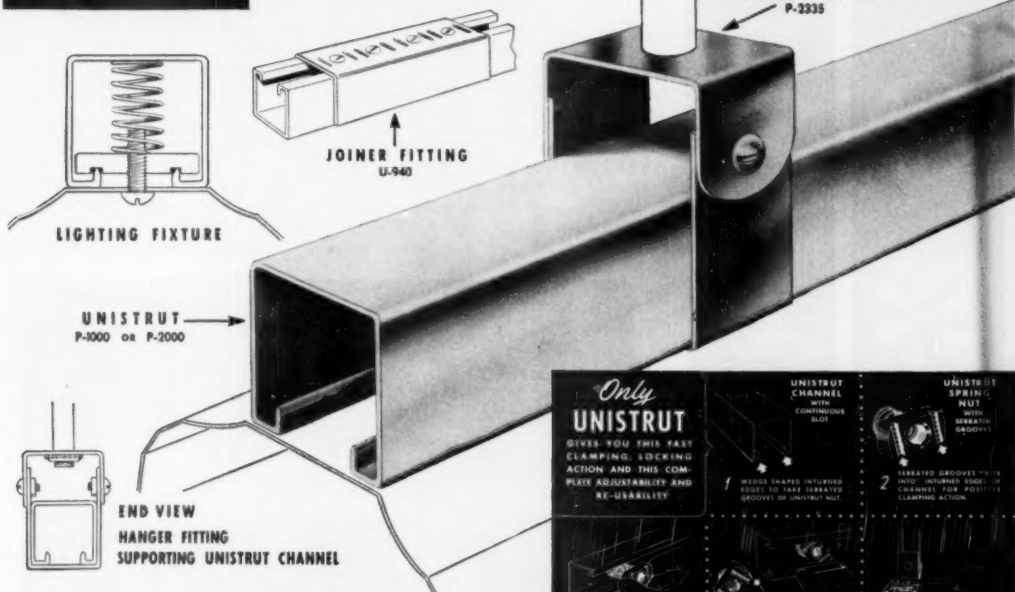


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30-inch fluorescents above the displays, while the cashier's counter is illuminated by a 4-foot 4-lamp fluorescent recessed installation. Intensities, taken approximately 1200 burning hours after the installation with the meter held 30 inches above the floor, were between 13 and 32 footcandles in the general sales area, between 30 and 35 ft.-c. in the display niches and 71 over the cashier's desk.

Throughout the store, ceilings are smooth white (oil paint on plaster) and floors are grey-carpeted. The seating area in the women's department beneath the dropped ceiling is backed by a flowered generally-grey wallpaper while niches in the two departments are dark grey and maroon. The overall length of the store is 72 feet, width is 13 and height of ceiling is 9 feet 6 inches.

Electrician's Shop Has 50 FC Level

An average illumination intensity of 52.6 footcandles is achieved in the electricians' shop of the Public Service Electric and Gas Company's terminal building in Newark, N. J., by suspending 43 semi-direct distribution type Futurliter fixtures from the 16.5-foot ceiling. All fluorescent units mount 40-watt white lamps and units are positioned an even 12 feet above the floor. Twelve of the units are 3-lamp luminaires while the remaining 31 fixtures are 2-lamp assemblies. The installation was planned by E. M. Fahey and J. A. Heffernan of Public Service Electric and Gas Company.

Flux is proportioned in the ratio of 22 upwards and 78 downwards in the

2-lamp units which have an efficiency of 80 percent. The 3-lamp units, with an efficiency of 73.5 percent, have a flux distribution of 16 upwards and 84 down. This distribution results in a comfortably luminous ceiling while maintaining high-level illumination on work benches and service areas.

Brightness values, taken at the same time as the footcandle readings after 200 hours of service, resulted in foot-lambert levels of 280 on reflectors, 6.3 outside the shields, 7 on bench tops, between 18 and 24 on upper walls, from 3.2 to 4 on the dado and between 2.8 and 3.6 on the floor. The shielding angle at right angles to the direction of the continuous runs is 27.5 degrees.



FUTURLITER FLUORESCENT UNITS, mounted end-to-end 12 feet above the floor of the Public Service Electric and Gas Company's electricians' shop, produces average footcandle intensities of 52.6 after 200 hours of service.

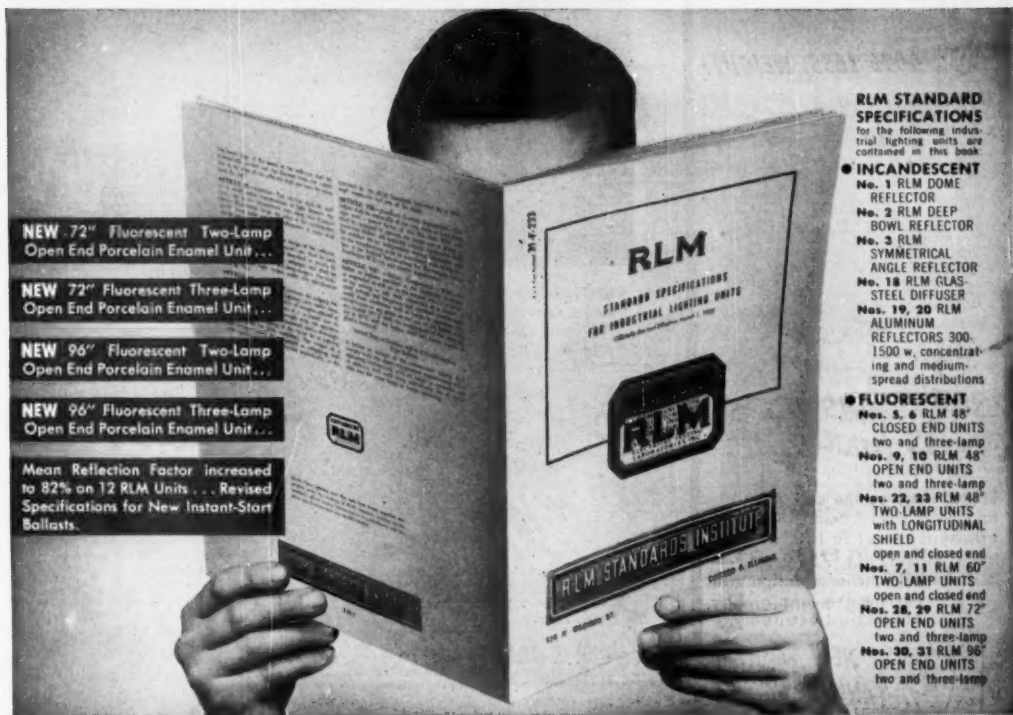
Fluorescent Gym Lighting

One of the most outstanding fluorescent systems in an indoor sports area is the installation at the Don Bosco Gymnasium in Milwaukee, Wisconsin. By using a combination of cove and direct downlighting, intensities rang-

ing from $7\frac{1}{2}$ to 60 footcandles can be provided.

The 94-foot long gymnasium area is covered by a curved roof with a wide air-conditioning duct installed along the center line of the ceiling. To light

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**NEW 72" Fluorescent Two-Lamp
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for the following industrial
lighting units are
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● INCANDESCENT

- No. 1 RLM DOME REFLECTOR
- No. 2 RLM DEEP BOWL REFLECTOR
- No. 3 RLM SYMMETRICAL ANGLE REFLECTOR
- No. 18 RLM GLASS STEEL DIFFUSER
- No. 19, 20 RLM ALUMINUM REFLECTORS 300-1500 w. concentrating and medium-spread distributions

● FLUORESCENT

- No. 5, 6 RLM 48" CLOSED END UNITS two and three-lamp
- No. 9, 10 RLM 48" OPEN END UNITS two and three-lamp
- No. 22, 23 RLM 48" TWO-LAMP UNITS with LONGITUDINAL SHIELD open and closed end
- No. 7, 11 RLM 60" TWO-LAMP UNITS open and closed end
- No. 28, 29 RLM 72" OPEN END UNITS two and three-lamp
- No. 30, 31 RLM 96" OPEN END UNITS two and three-lamp

This New, Free Book of RLM Specifications Gives You the Up-To-Date Information Needed for **BETTER PLANNED LIGHTING**

For Better Planned Lighting, everyone who specifies, recommends, buys or sells industrial lighting equipment needs a copy of this new book, officially revised on March 1, 1950 and just off the press. It contains nineteen officially approved RLM Specifications. This book is a valuable aid in measuring illumination, construction and performance standards which are basic to lighting equipment efficiency, economy and ease of maintenance.

New RLM Slimline Lamp Units Included are 4 important, newly-established RLM

Standards (Nos. 28-31) for industrial lighting units, designed to utilize the new, longer-length Slimline Fluorescent Lamps. Equipment conforming to these standards and bearing the RLM Label is now available. The minimum RLM Standards established for these Slimline industrial units are based upon extensive tests which have indicated these standards to be essential to satisfactory, efficient and economical performance.

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Units are among the important revisions to existing RLM Specifications contained in the new RLM Book. The reflection-factor increase from 79% to 82% brings users greater efficiency and more light for the money, widens opportunities for Better Planned Lighting; and increases the importance of specifying units bearing the RLM Label. If you specify, recommend, buy or sell industrial lighting equipment, a copy of this new book, "RLM Standard Specifications for Industrial Lighting Units", is available to you without cost or obligation. Write RLM Standards Institute, Inc., Suite 819 326 W. Madison Street, Chicago 6, Illinois



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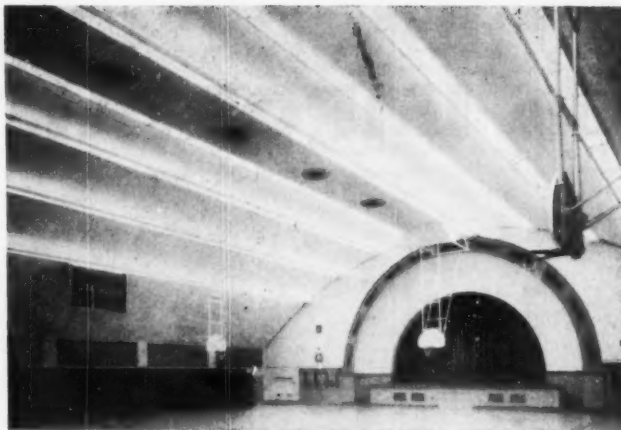
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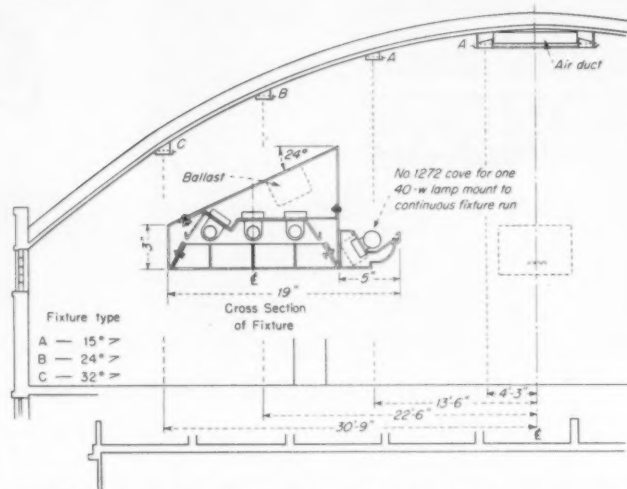
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CONTINUOUS ROWS of fixtures combining louvered fluorescent direct and indirect cove lighting illuminates the Don Bosco gym in Milwaukee. Flexible circuit and control arrangement provides intensities ranging from 7½ to 60 footcandles.



SECTIONAL VIEW of gymnasium structure showing location of fluorescent rows and section of installed fixture. Note addition of fluorescent cove to direct unit.

the room, Daybrite Lighting, Inc., St. Louis, furnished eight continuous rows of fixtures—11 units per row. Each line of fixtures contains three rows of T-8 lamps (11 lamps per row) operated at 200 milliamperes and shielded by aggregate louvers.

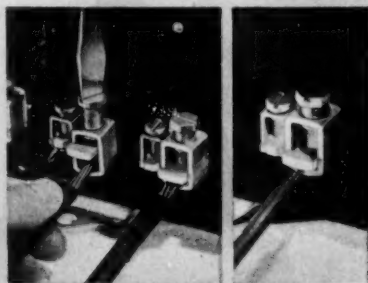
The two center rows of fixtures are installed flush with the border of the air duct and contain an indirect cove on each outer side to illuminate the adjacent ceiling area. At the stage end of each row is a recessed adjustable incandescent spotlight unit. The other six rows of units are spaced to permit installation of acoustic ceiling blocks without cutting. The backs of these fixtures are sloped to fit the contour

of the curved ceiling. The inner edge of each row of units contains a cove to illuminate the upward slope of the gym roof. Each cove contains eleven 8-foot and one 6-foot lamps operating at 100 milliamperes, and runs the full 94-foot length of the gym.

Various lighting intensities are obtained by circuit arrangement and fixture control. The center line of lamps in each continuous row of units is controlled separately from the outer lines of lamps. One, two, or three rows of lamps can be used as desired.

Four pushbutton stations, one at each door, operate through a pre-set arrangement on the stage to control any desired pre-arranged pattern.

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Strong, one-piece cast aluminum alloy housings are designed to exclude dust from the interior and to avoid accumulation of dust on the exterior surface. Available in many types and sizes.

Pyle-National also manufactures a complete line of explosion-proof and dust-tight supporting PYLETS for lighting fixture mounting, in addition to an extensive line of the most commonly used types of conduit fittings, switches and circuit breakers for hazardous locations. Consult the new PYLET Catalog

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Industrial Electrification

Electrical Recording Instruments—Part I

Factual data provided by electrical instruments can point the way to waste reduction, lower costs and higher productivity in industry. This first article of a series reviews classifications of instruments with specific emphasis on the electrical recording type.

THE biggest problem facing industrial management today is the lowering of costs and increase of production. A major focal point of management's efforts is the reduction of waste and increase of operating efficiency throughout the entire plant. To reach this goal, factual data must be obtained. Once this information is at hand, a searching analysis of operations plus the application of good old common sense, past experience, and technical know-how may well pave the way to a solution.

Some factual information can be secured by relying on the human senses. We can hear steam or compressed air escaping, smell gas, and see oil or water leaks. We cannot, however, rely on our senses to detect waste of electrical energy—the backbone and life-line of practically every industrial operation. Human senses must be supplemented by instruments—the most accurate and quantitative means of detecting waste and hence building efficiency. Once management knows just exactly what is happening, through instrument records, it can plan to make the most efficient use of electrical power, machine power, manpower and materials.

Electrical instruments are not used solely for the measurement of electricity in the strict sense of the word. In addition to conventional power, current and voltage surveys, instruments are being used to measure many non-electrical phenomena now being converted to electrical quantities which can be recorded. This brings the vast field of material inspection into the realm of electrically recorded data.

Types of Instruments

Electrical measurement fundamentals have been known since early in the 19th century, long before electrical power brought electrical industrializa-

By Chester M. Poor
Application Engineer
The Esterline-Angus Company, Inc.
Indianapolis, Indiana

tion. Electrical instruments today are "tops" in the realm of tools, yet their usefulness is often wasted by improper selection and application. This series of articles is designed to bring about a better understanding of electrical recording instruments, their selection, application and care. However, before focusing attention on this one specific unit, it might be well to have a basic understanding of the different types of instruments available.

Electrical instruments may be divided into three general classifications: integrating, indicating, and recording instruments. Each type has its place in the field of measurement and, if a job is to be done correctly, one type cannot be used in place of the other.

Integrating Instruments

Everyone is familiar with this type of instrument whether by name or appearance. This is the kind of instrument used to measure the amount of power consumed for determining costs or for billing. Many plants use these instruments for determining power costs in different departments where such power costs are important in themselves, or are a good guide to department operations. *These meters show accumulated totals but do not read instantaneous values.* They cannot be used where an indicating or recording instrument is required.

Indicating Instruments

An indicating instrument gives direct readings by means of a pointer and a scale. This type of instrument will often serve adequately on jobs involving operation checkup of motors having steady loads, such as blowers

and centrifugal pumps, where the information desired can be obtained in a matter of minutes. The indicator will also serve effectively in checking voltages on distribution lines which carry fairly steady loads; in locating trouble in switchgear and distribution equipment; and in trouble shooting which, because of the type of equipment involved, is likely to be of a routine or simple nature.

There are many instances in which the indicating type instrument will not give all the information necessary for correct analysis. For instance, voltage or power may be changing at such a slow rate as not to be noticed on an indicator, but to have sufficient bearing on the test being made. On the other hand, electrical values may be fluctuating at such a rapid rate that a proper reading cannot be obtained on an indicator; or the observer's attention might be elsewhere for the period of fluctuation and thus the change will be entirely missed. By continuously metering and recording electrical values, the recording meter will make a permanent record of sudden and unexpected power surges or voltage failures.

Recording Instruments

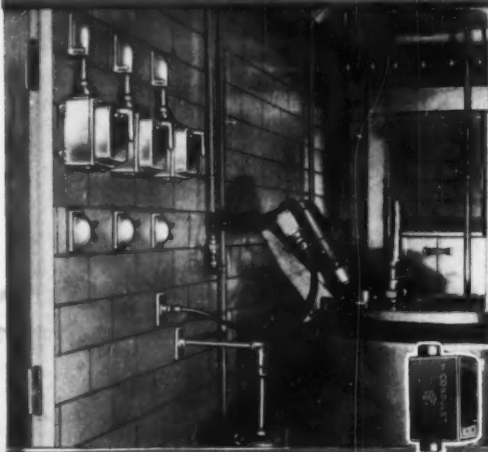
The role of electrical recorders in construction and maintenance in industry encompasses a multiplicity of important duties. These may start at the distribution transformer outside of a plant and follow through every application of electricity even to the degree of testing the final product. Often dubbed the "Sherlock Holmes" or "Fact Finder" of industry, recording instruments are the standard tools of the maintenance engineer. They are used in the design and selection of motors and plant machinery, preventive maintenance, discovering hidden losses, trouble shooting, inspection and testing of products, in a super-

the **CONDULET*** and rigid conduit
method gives you maximum

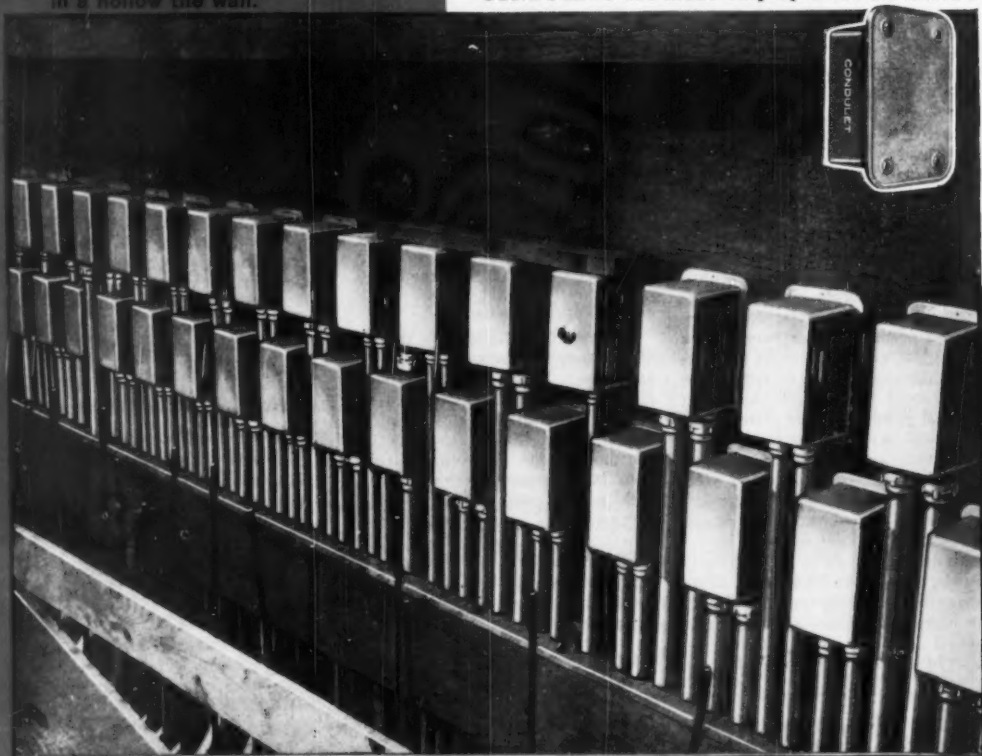
PROTECTION and SAFETY in concealed work

When you plan a job of concealed electrical wiring, every factor that has a bearing on the kind of service it will give throughout the life of the installation should be carefully considered.

***CONDULETS** are made only by **CROUSE-HINDS**



FS Series Condulets installed in a hollow tile wall.



Type AEQ Condulets, with brazed hubs, placed in position on concrete form.

1 ECONOMY . . . Add up the material and the installation costs and you will find that Condulets and rigid conduit compare favorably with other wiring methods. Then consider the other advantages and you will find that Condulet and rigid conduit is the really economical method that pays extra dividends over the years.

2 GROUND CONTINUITY is of vital importance in concealed work because any joint that isn't tight in the beginning makes a high resistance point and after the concrete has been poured there is never any way to locate and correct the faulty condition. CONDULETS, with their taper threaded hubs, and rigid conduit with its tapered threads make a secure joint that provides a reliable and permanent low resistance path to ground. This SAFETY feature affords maximum PROTECTION against personal injury and fire.

3 CORROSION RESISTING . . . Cast Feraloy Condulets offer the best PROTECTION wherever moisture, dust, or corrosive atmospheres are present. This quality is very important in concealed work because corrosive tendencies are greatest where there is a change of medium, as at the point between the floor or wall and the air.

4 FLEXIBILITY . . . In concealed work Condulets with blank covers can be placed at strategic locations to provide future outlets to meet changing conditions.

5 SECURE ATTACHMENT OF DEVICES . . . The mounting holes in CONDULETS are drilled and tapped in the cast metal body — no weak mounting ears to twist off. All devices are FIRMLY attached.

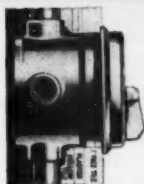
6 QUALITY . . . For more than forty-five years CONDULETS, made only by CROUSE-HINDS, have been the standard of quality, built from the finest materials, with painstaking care, by skilled craftsmen.

7 VARIETY . . . There are thousands of types and sizes of CONDULETS, plugs and receptacles, and lighting fixtures including a complete explosion-proof and dust-tight line for use in hazardous locations.

On your next job of concealed work, plan to get all of the benefits of sturdy Cast Feraloy CONDULETS and rigid conduit. Send for additional information on modern CONDULET installation.

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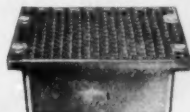
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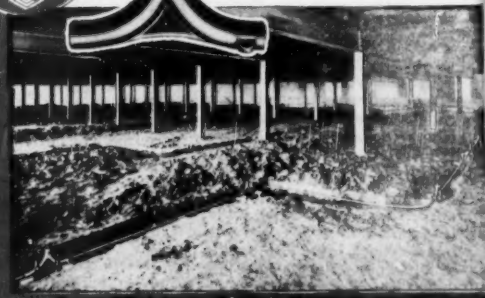
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visory capacity and in some instances as controllers.

Generally speaking, the recording instrument is used to obtain performance records of industrial plants, distribution equipment, the operation or handling of the machinery, or where economic or human imperfections make the use of an indicating instrument impractical. All well-equipped maintenance men have both the indicating and recording type of instrument in their instrument lockers and usually know enough about the test or measurement to be made to select the proper instrument. This selection will depend upon: the type of equipment involved; outward indications of any existing trouble; and the type of test involved (short-duration checks or detailed or long-period performance records).

Construction of Electrical Recorders

Fundamentally, the principles of electrical recorders are much the same as for electrical indicating instruments. The basic component, or heart of the recorder, around which the rest of the instrument is built, is the measuring element. The type of measuring element employed depends upon whether the electrical quantity to be measured is ac or dc, and upon the magnitude of the electrical quantity encountered. The principle of operation was discussed in the article "Electrical Indicating Instruments," which appeared in the August, 1947, issue of *Electrical Construction and Maintenance*, or may be found in any authoritative book on electrical measurements. *The same type of measuring element is used in both indicating and recording instruments for the same type of measurements.*

The real difference between recorders and indicators lies not in the measuring element, but in an added mechanism which allows the meter to reproduce readings on a chart so that a continuous record of electrical values is made possible.

One of the first electrical recorders ever constructed performed this function very simply. A wind-up phonograph motor was revamped to pull a strip of adding machine paper across a metal plate. The electrical measuring element, taken from an indicating instrument, was mounted in a vertical and inverted position above the metal plate so that the pointer swung back and forth in a plane parallel to the plate and just a fraction of an inch above it, with the pointer motion being at right angles to the motion of the chart. To get this pointer to write a record of electrical values on the paper as it passed beneath the pointer, an automobile spark coil was connected so that one terminal of the

high voltage secondary was connected to the pointer and the other terminal to the metal plate beneath the paper. The high voltage coil produced an arc which jumped from the pointer, through the paper to the metal plate, and produced a burned-line record.

Although the above arrangement may sound primitive, it contained the three components required. These are: the measuring element; a writing system to transcribe motions of the measuring element's pointer to a record on paper; and a chart drive mechanism to move a piece of paper at a fixed rate so that the record will be proportional to elapsed time.

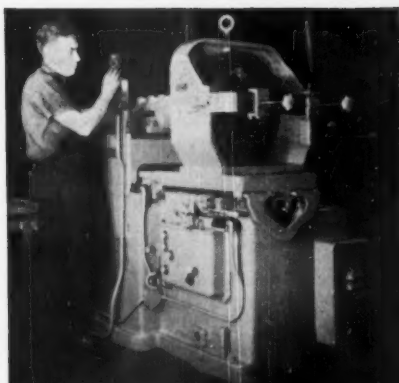
The practical aspects of recorder construction involve more problems than meet the eye. The measuring element must produce enough torque to overcome any friction developed in the writing system so that drag of a writing pen or other type of printing or writing mechanisms will not affect accuracy or speed of response. The writing system must be so designed that a complete and satisfactory record is drawn at all times on the chart, regardless of the speed of the chart or the rapidity of fluctuations of the electrical quantities being measured. At the same time, the measuring element must overcome the inertia of the writing element which, by necessity, is much heavier than the needle of an indicating instrument.

Types of Recording Instruments

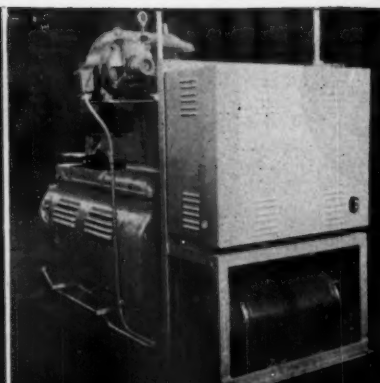
Recording instruments are basically classified into two distinct divisions: circular chart and strip chart. Circular, or dial type, recording instruments can be provided with various chart speeds so that a chart will make one complete revolution in only 15 minutes or so that a complete revolution may take as long as seven days. Generally speaking, *the most common time cycle is a complete revolution in 24 hours.* Strip chart type of recorders, depending upon their design, can be made to supply a variety of chart speeds varying from 3/4 inch per hour up to three inches per second.

There are several advantages of the strip chart over the dial type wherever factual data is being collected for further study. Most important is the fact that the record on the strip chart is easily interpolated because the time divisions on the paper are uniform and can be read easily. The divisions on the circular chart are wedge shaped and as the values of the quantity being measured decrease, driving the writing pen toward the inner perimeter of the chart, the effective chart speed decreases, crowding the record and interfering with its easy interpretation.

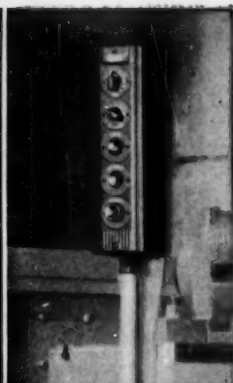
The above two types of recorders



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FIG. 1—Recording millimeter of the direct-writing, ink-on-paper portable type. Unit records automobile speeds in miles-per-hour for use with radar-type "traffic cop."

are further classified as to their writing mechanism. These are *direct-writing recorders*, in which the writing mechanism is actuated directly by the measuring element, and the *indirect type*, in which the writing mechanism is separated from the primary measuring element and is actuated by means of some sort of relay or servo-mechanism.

Electrical recorders illustrated in this article are of ink-on-paper type, with direct-acting writing mechanisms, as shown in Fig. 1. This type of recorder has the advantage of simple construction, coupled with speed of response.

Measuring Elements

The measuring elements in electrical recorders must have considerably greater torque than those for indicators, in order to overcome inertia and friction in the writing system. A direct-writing, ink-on-paper recorder will have a torque on the order of 100 times the torque of a large portable indicating instrument, and as much as 1,000 times the torque of small indicating panel instruments.

For measurements of direct current, the permanent-magnet, moving-coil type of measuring element is employed, as is true in the case of dc measurements with indicating instruments. However, in order to obtain desirable sensitivity and accuracy, the torque of the recorder measuring element is quite a bit larger than that for an indicator. The element shown in Fig. 2 weighs about six pounds and has a swinging speed of 0.5 second.

Alternating current measurements are made with the standard electro-dynamometer movement. A typical

movement for measuring watts is shown in Fig. 3. This element weighs approximately seven pounds and has a response speed of 1.4 seconds. Dynamometer elements are also used for measuring ac volts and amperes.

For recording frequency, power factor, or conductivity, the crossed-coil type of electro-dynamometer measuring element is employed. The element is similar to the one used in the wattmeter but it has no torque springs and, hence, no free zero. It measures the ratio of the currents in its two coils.

Another and newer method of measuring power factor employs two wattmeters. One meter measures watts and the other measures vars, or reactive volt-amperes. A more detailed description of this method follows later in the series.

One other type of measuring element is also available in electric recorders. While not strictly an electrical measuring element in the sense of measuring changing electrical quantities, it uses electric current for its operation and is closely allied with electrical circuits. This instrument may be known as the *production recorder*, *time recorder* or *operation recorder*, depending upon the manufacturer. Its function is to record the "on" and "off" time, active and idle time, presence of voltage, presence of current, operation of valves, relays, switches, and other equipment.

The heart of the *operation recorder* is a small electro-magnet which, when energized, causes a writing pen to move about 1/4 inch on the chart in a direction normal to the chart movement. When the electro-magnet is

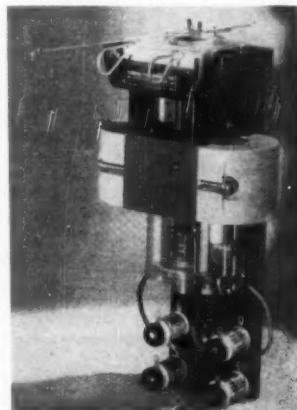


FIG. 2—Permanent magnet, moving-coil type of measuring element used in dc recording instruments. Writing pen rides in stirrup attached directly to moving coil; provides one moving part in entire measuring element.

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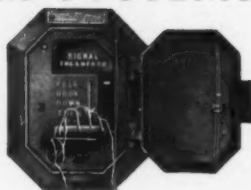
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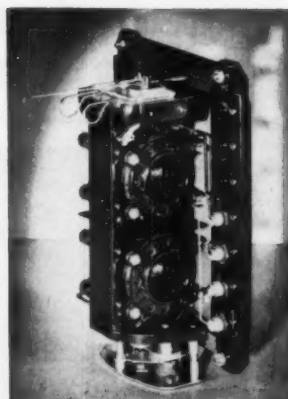


FIG. 3—Electrodynamometer measuring element used in recording wattmeters. Rigid molded Bakelite frame keeps all parts in accurate alignment; makes possible insulation test of 5,000 volts ac between circuits.

energized, the writing pen moves to its "on" position and remains there until the electro-magnet is de-energized. Thus, for the time that the pen is in its "on" position, a displaced line is recorded on the chart.

Instruments of this type are available with as many as 20 pens all writing on a single chart, so that the time of occurrence, sequence and duration of as many as 20 events, machines or operations, can be recorded. A typical instrument, with such a record, is shown in Fig. 4.

Chart Drives

Strip chart type of recorders, depending upon their design, can be made to supply a variety of chart speeds varying from 3/4 inch per hour—at which speed a chart will last 65 days—up to 3 inches per second, at which speed a chart will be consumed in only seven minutes. Strip chart recorders discussed here are constructed so that gears can be changed manually to give speeds of 3/4, 1 1/2, 3, 6, and 12 inches per hour. In addition, the recorder can be supplied with a manual or electrical gear shift to change the "hour" speeds to "minute" speeds such as from 3 inches per hour to 3 inches per minute. Speeds of 3/4, 1 1/2 and 3 inches per second are provided by the addition of an external motor drive device which can shift from the customary "hour" or "minute" speeds to the high "second" speeds by an electrical or automatic clutch.

A spring-powered chart drive is generally used where the record must not be affected by power failure or where controlled frequency ac power is not available. The motive power is

provided by springs which are wound by hand. The springs store enough power to drive the chart reliably for eight days. Changes in hour or minute speeds are made by changing gears between the train and drive roll. In addition, a gear shift changes the chart speeds from inches-per-hour to the same number of inches-per-minute or vice versa. At any minute speed, the clock will run from 3 to 4 hours on one winding of the spring. This type of drive provides a wide range of chart speeds and is especially useful on portable units and on meters to be used for a variety of work, such as research and plant surveys.

The motive power of a synchronous motor chart drive is provided by a powerful, self-starting synchronous motor which can give any chart speed in the group of $\frac{3}{4}$, $1\frac{1}{2}$, 3, 6, and 12 inches per hour. A change from inches-per-hour to the same number of inches-per-minute, or vice versa, can be made by shifting a lever on the exterior of the clock. At times it is desirable to have the chart run at slow speeds part of the time, and at minute speeds at intervals. This can be accomplished by supplementing the lever for changing the chart speeds from an hour to a minute by an electro-magnet. This type of drive makes it possible to control the change of chart speeds from some point outside the meter.

It is often desired to have the chart motion proportional to something other than time. This is true when the instrument is being used to make a record of the thickness of sheets, flaws in cable, etc. In such cases, the recorder is a "phantom" drive having a shaft which is extended from the gear train and which can be connected to any desired means for propelling the chart. By using different gear ratios between the shaft and the drive roll, the chart speeds can be changed. Standard gear combinations give chart

speeds of $\frac{3}{4}$, $1\frac{1}{2}$, 3, 6, and 12 inches of chart per revolution of the extended shaft.

An external motor of special design can be attached to the exterior of the instrument case. With suitable gearing between the clock and motor, it can drive the chart at speeds of inches-per-minute or inches-per-second corresponding to the hour speeds for which the clock is geared. The drive is through an over-running clutch which permits the motor to take control whenever it is energized manually or is engaged by means of a trip coil. In the latter case, the motor runs continuously but the gears are normally disengaged. When the trip coil is energized, a latch is released and the gears are instantly thrown into mesh by a spring. In case the external motor is geared for inches-per-second, the chart runs at 3,600 times its hour speed and so in 24 seconds a normal consumption of 24 hours of chart is used. When the trip coil is energized and controlled by an external relay responsive to the disturbance being recorded, it can be controlled so that, after the 24-second cycle, the normal chart speed will be resumed at the correct time of day on the chart.

Writing Mechanisms

There are a number of electrical writing mechanisms available today to transcribe the rotary motion of the measuring element to a record on paper.

In the direct-acting, ink-on-paper, type of electrical recorder, the writing pen is carried and operated directly by the moving element. This eliminates any relays, balancing circuits, or servo systems. The pen is a small metal tube having one end bent to extend vertically into an inkwell, while the other end carries a pen point. Ink is supplied from a reservoir located near the axis of the writing system and flow from the well to the pen point is by capillary action. A removable cover seals the inkwell, except for a small opening through which the metal pen tube fits.

Cases

Users of recording instruments have a choice of a variety of cases, depending upon how and where the instrument is to be used.

For permanent mounting, the preferred arrangement is a flush switchboard type of case permitting flush installation with an instrument panel.

Two meters can be mounted together in a twin case. Such an arrangement saves switchboard space, permits the chart drives to be coupled (thus synchronizing the two records), and makes a more rigid installation.

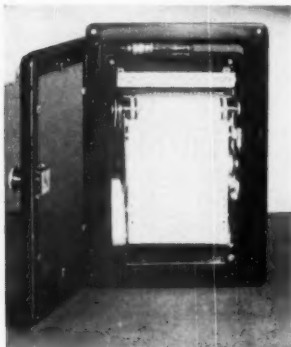


FIG. 4—Flush switchboard type recorder with 20 pens operating on a single chart.

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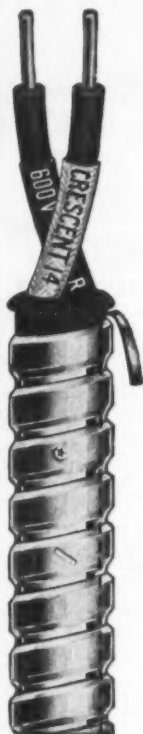
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In the News

Washington Round-Up

After more than two months of fighting in Korea a pattern of the future U. S. economy begins to shape up. First reactions, over the first five or six weeks of the conflict, were for an all-out military program and return to priorities and price controls of World War II type. As United Nations forces began to check North Korean communists in their drive south of the 38th Parallel, and Washington officials had time to study and appraise military and civilian needs in more detail, a defense program geared more accurately to today's requirements began to emerge. While details of this program are still in the making, the general objectives are fairly well established.

Objective of the new defense program is the rapid expansion of industrial capacity, the production of military armaments and needs over and above civilian requirements, and a minimum impact on the civilian economy. This program will result in a combination military-civilian economy, and it or some similar program is now proposed for the next few years regardless of the outcome of the Korean battle. All-out war with Russia would merely put more emphasis on military needs, less on civilian.

Economic controls are scheduled for approval by Congress, and are expected to give President Truman power to 1) set up priorities and allocations of critical and scarce materials, 2) control consumer credit, 3) invoke price and wage ceilings (at roll back status), and 4) requisition equipment and supplies for defense. The intent of the bill is to give Truman power to meet all contingencies and emergencies as they come up.

Among scarce materials which may be first on the list to be controlled are rubber, tin, copper, zinc, lead, aluminum and steel. Military estimates for limited mobilization now in effect indicate steel requirements will be some five or six percent of total production—far less than had originally been expected. Other items, such as copper, rubber and tin, are reported in extremely tight supply. Priority and allocation control of some of the more critical items can and will force electrical construction work into priority projects primarily.



NEW OFFICIAL FAMILY of the Midwest Electrical Council, Inc., Minneapolis, comprises: (L to R) manager—Gordon Tucker, Minneapolis; vice-president—John H. Engel, Rochester, Minn.; president—Clyde Kieley, Grafton, North Dakota; treasurer—F. M. Tripp, Minneapolis; secretary—Wm. A. Ritt, St. Peter, Minnesota.



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Major market for electrical construction is tied closely to new building construction, and to modernization of existing structures. Here's how the new building construction program stacks up:

Military construction is in fairly good shape. Army camps have more than ample housing for current enlistment programs, and Navy housing is far in excess of present requirements. To reactivate these World War II training centers will probably require maintenance and repair work only. Under present mobilization plans no new training centers are considered necessary.

Electrical utilities, already in the midst of an expansion program begun five years ago, are expected to con-

tinue with their program for at least another five years. From a capacity of 38.8 million kw in 1939, this industry expects to have a total capacity of 67.5 million kw by the end of 1950. Since available electric power will determine to considerable extent the nation's ability to meet all required production, utilities may be expected to get priorities assistance when and if it is needed.

Home building, experiencing its biggest year in history, is slated to slow down. Truman's clamp-down order on easy housing credit, which brought on a nationwide wave of panic buying in July, is expected to reduce the 1951 housing starts to some 50 to 60 percent of this year's estimated 1,100,000 starts.

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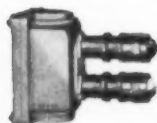
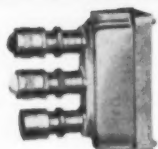
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Veterans Administration's hospital building program will presumably continue in full swing, at least unless and until materials and labor shortages begin to affect defense production seriously. Priorities assistance will then probably keep this program going until present contracts and commitments are completed. Eventual slowdown will probably be based partly on manpower shortages—including both labor to build new hospitals, and doctors, nurses, janitors, maintenance engineers, etc., required to staff them.

Public Buildings Administration projects and work, subject to annual Congressional appropriations, will probably be limited to present projects now under contract and to the three-year \$30 million maintenance and repair program now in effect. Exception may be certain priority projects including some of a classified nature. About one-third of the maintenance and repair program will cover electrical work, rewiring, relighting, etc., including elevator repair.

Commercial construction already under way will be permitted to continue to completion under present plans. Shortages of some building materials, plus scarcity of critical metals, lack of labor, and general rising costs of material and labor, will slow down all but essential commercial construction. Even so, except for an all-out war, commercial construction may continue to be sizable but carried on at a slower pace as critical materials can be obtained.

Industrial construction, whatever the essential demands may be, will be given the necessary assistance from design stage to completion. Such assistance will include financing, priorities for building materials, manpower and labor, and for the machines, tools, etc., required to put the plants into production of essential war and civilian products.

Just how much new industrial construction will be needed, or how much modernization of old plants is required, still has to be determined. It will depend on whether we have a ten percent mobilization for war, or some other percentage, up to and including total mobilization. Some appraisals have indicated that, except for the possibility of a few specialized plants for the production of new weapons and war material, present plant facilities will be adequate, especially if geared to two and three shift operation.

One appraisal with considerable merit recognizes that the great majority of present industrial production comes from obsolescent industrial plants which are wasteful of one of the most critical shortages during wartime—*manpower*. Proponents of this appraisal believe that new industrial



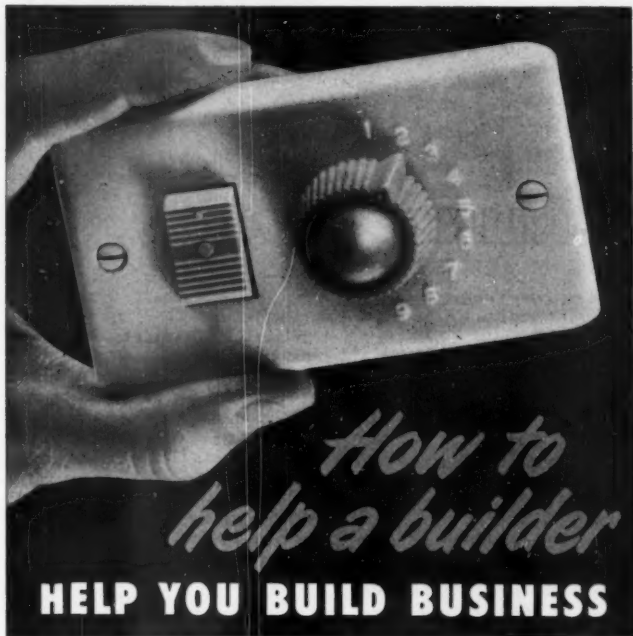
1 Suggest master selector switch for master bedroom. Tell him home buyers are excited about the idea of controlling fans, coffee makers, and lights right from bedside.



2 Show him how master selector switch can be placed in front entrance hall, to provide over-all control of lights and outlets. Gives him a strong talking point the minute a prospect enters.



3 Remote control permits practical extension of the usual two-point control of cellar or attic light by providing a switch at the bedside, for these often forgotten lights . . . a strong selling point.



4 Explain the pathway-of-light idea. Help him plan so that home owner can light his way through the house, turning lights ON and OFF as he goes — with G-E remote-control switches.



5 For outside lights, porch lights, breeze-way lights, garage lights — remote control is a natural. Control them from entrance hall, rear door, and at the lights themselves.


Merchant builders can always use a real selling feature. And—right now—you're in a position to give it to them.

To help your builder increase his sales—to help yourself build more business on every house—show him the new General Electric master control switch. It makes a real talking point for you. It's something he can actually show his prospects.

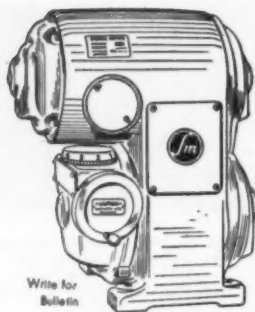
Pick up one of these new master control switches from your General Electric distributor. Show it to

your builder, and explain some of the conveniences he can add to his homes. It means a small added expense to him—extra business for you on every house.

It will pay you to be first in your community to offer General Electric remote control. So see your distributor now for facts on General Electric remote control. For a handbook on the General Electric remote-control wiring system write to Section D7-918, Construction Materials Department, General Electric Company, Bridgeport 2, Connecticut.

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DUAL SILVER POINT — FULLY AUTOMATIC

FLUORESCENT STARTERS

—completely eliminate
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and flickering of dead
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GUARANTEED — FOR ONE YEAR!

PROTECTS — Automatic thermal relay cuts out defective lamps, eliminates annoying blinking and protects all auxiliary equipment.

SIMPLIFIES — Replacement of defective lamp automatically recycles starter circuit. No buttons to push — no replacement of starter.

REDUCES COST — Magno-Tronic starters provide exact timing of electrode heating, preventing excessive loss of emission material, thus assuring maximum possible lamp life.

VERSATILE — Built to operate efficiently over an extended voltage and temperature range.

Demonstration and Literature on Request.



SP-15-20 For use with 15 or 20 watt lamps.

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ON STATE BOARD of Electricity staff in Minnesota are: (L to R) John A. Warkentin, Mountain Lakes; Charles W. Turner, Minneapolis; and Norman R. Johnson, Detroit Lakes, Minnesota.

plants should be given top priority; also, that obsolete factories should be revamped and modernized.

Whether new factories are built, or old ones revamped, a major contribution to maximum industrial production and to saving of manpower is the installation of adequate electrical facilities—use of bus ducts, new larger feeders and branch circuits, higher voltages for power distribution in large area plants, improved lighting, automatic controls, and many other such power and labor saving features. Such an electrical modernization program would contribute tremendously to the new economy ahead—for greater and for faster production of military and civilian products.

With price rises now coming thick and fast, inflation is already a major headache. Bidders of electrical construction will of necessity consider the use of escalator clauses in new contracts. One heavy construction contract is reported to have gone a step further, and to have spelled out "contract termination" details in case the project is stopped before completion of the job.

Some bonding companies have cautioned their customers against firm bids on long term contracts. While bonding insurance rates are reported to be the same, this recommendation of caution forewarns of the dangers of rising costs now prevailing on practically all construction materials.

Dryden-Harlan Now in Milwaukee

Dryden-Harlan Electric Company, Inc., has moved its main office from Appleton, Wisconsin to Milwaukee. The new address is 407 E. Michigan St., Milwaukee 2, Wisconsin. Lee Dryden, president of the firm will headquarter at the new location.

Stephen J. O'Brien

Stephen J. O'Brien, founder and president of S. J. O'Brien, Inc., electrical contractors, and of S. J. O'Brien Sales Corporation, Frigidaire refrigeration and air conditioning dealers, New York City, died on August 10 after a brief illness. He was 62 years old.

Mr. O'Brien had been president of the Electrical and Gas Association of



S. J. O'BRIEN

New York, the New York State Association of Electrical Contractors and Dealers, Independent Electrical Contractors Association, Uptown Chamber of Commerce and Greater City Electrical Contractors Association.

He had been vice chairman of the Joint Industry Board, a member of the National Electrical Contractors Association, Electrical Associates, National Industrial Service Association, and many fraternal, service and social organizations.

Who's Who in NISA Chapters

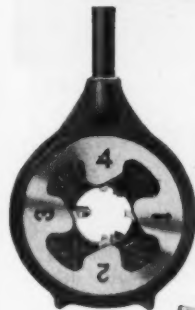
As a result of action taken at the recent annual convention of the National Industrial Service Association and at various NISA Chapter meetings, the following list of officers can be added to previously published items concerning Chapter activities and elections.

National Officers. President—H. E. Grant, Tennessee Electric Motor Service, Nashville, Tenn.; vice-president—Joseph F. Ferrari, Excel Electric Service Co., Chicago, Ill.; secretary—M. F. Zack, Zack Brothers Electric Co.; Mason City, Iowa; treasurer—C. R. Durand, H. N. Crowder, Jr., Co., Allentown, Pa. New members of the Board of Directors are: H. Q. Griffith

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Trade-Mark
5-in-1 Outfit



5-in-1 Precision Outfit . . . \$22.50

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An all 'round outfit—as easy to use on a pole or underground as in the shop... Four stems and soldering copper handle all soldering, heating, and brazing work... Needle valve control gives exact flame and heat for each job... Lights instantly at full heat regardless of drafts or weather

... No pumping, priming, or generating ... No smoke or fumes. • Ask your nearest "Prest-O-Lite" Jobber or write us for further details. The Linde Air Products Company, 30 E. 42nd Street, New York 17, N. Y. In Canada: Dominion Oxygen Company, Limited, Toronto.

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Fixture Hangers
FOR INSTANT ALIGNMENT

At last you can get a Fixture Hanger that turns to any angle after being screwed to an outlet box. Although base and receptacle remain stationary, hanger arms may be turned to align with any preconceived lighting plan. Exclusive Friction Ring firmly holds fixture in selected position. Hanger screws on to 3/4" or 4" outlet boxes, no other fastening necessary. Furnished complete with receptacle, two 5' chains, hooks and cord clips. Also available with bushed hole only, or with 3 wire solid ground receptacle. All Friction-Set Hangers are approved by the Underwriters' Laboratories. K100 shown above, List Price \$1.10 • Write for Bulletins K25, K26 and K27

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OREGON CONTRACTORS Riley Taylor (Ace Electric) and Eric Christensen discover mutual interests in chat with Washington contractor Leon Hampton at recent NECA chapter meeting.

(Region 2), Belyea Co., Jersey City, N. J.; H. A. Lilly (Region 5), Tampa Armature Works, Tampa, Fla.; R. A. Scherer (Region 8), Scherer Electric Co.; Indianapolis, Ind.; M. F. Zack (Region 11), Zack Brothers Electric Co., Mason City, Iowa; Wm. H. Hogue (Region 14), Larsen-Hogue Electric Co., Los Angeles, California.

Quaker City Chapter in Philadelphia. President—John C. Persson, Electric Apparatus Repair Co.; vice-president—Joseph B. Wagner, Wagner Electric Service; secretary—Frank Schaefer, Frank Schaefer Associates; treasurer—Wm. H. Hendrickson, W. M. Hendrickson & Company.

Louisville Chapter (Kentucky). President—Robert Campbell, Krauth-Campbell Electric Co.; vice-president—Edward Sharre, Clark Electric Sales & Service Co.; secretary—Owen W. Gollar, Jr., Owen Gollar Electric Co.; treasurer—E. M. Murphy, Marine Electric Company.

Cincinnati Chapter. President—Burt Hendrickson, Glow Electric Co.; vice-president—Edgar B. Conradi, Barkley Electric Co.; secretary—Selden F. High, Sullivan Electric Co.; treasurer—J. Bruce Matlock, Matlock Electric Company.

Washington, D. C. (Electric Motor Service Ass'n). President—Leon E. Hopkins, Carty Electric & Armature Works, secretary—E. A. Bishop, Potomac Armature Service; recording secretary—J. W. Lainhart, Warfield & Sanford; treasurer—John F. Warfield, Warfield & Sanford.

Indiana Chapter. Chairman—Glenn F. Buschman, Kirby Risk Electric, Lafayette; vice-chairman—Alvin Brehob, Meier Electric & Machine Co., Indianapolis; treasurer—Richard Erber, Capital Electric Service, Indianapolis; secretary—R. A. Scherer, Scherer Electric Company, Indianapolis.

New Orleans Chapter. President—

S. J. Stewart, S. J. Stewart Electric; vice-president—Harry Mentrup, Nola Electric Co.; secretary-treasurer—Charles W. Hiers, New Orleans Armature Works.

Wisconsin Chapter. President—N. J. Koenig, Koenig Electric Co.; vice-president—R. H. Trester, Trester Service Electric Co.; treasurer—Roy Schulz, Al Schulz & Son Electric Co.; executive-secretary—E. H. Herzberg—all of Milwaukee.

SDECA Gets Manager

The South Dakota Electrical Contractors Association, an affiliate of the Midwest Electrical Council, Inc., recently placed the management of their activities on a full-time basis. To guide the affairs of the group and increase the services to its growing membership, SDECA appointed William Miekke to the newly created position of Manager.

Minnesota Co-Ops Push Reinspection

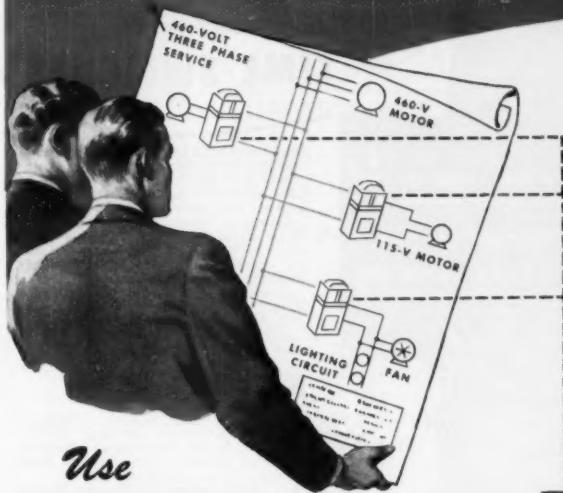
Reinspection of rural wiring is on the march in Minnesota. Seven rural electrification projects have farmstead wiring reinspection programs under way at present; 16 electric cooperatives in the State are planning to join the drive.

Reinspections are now being made on the following projects: Runestone



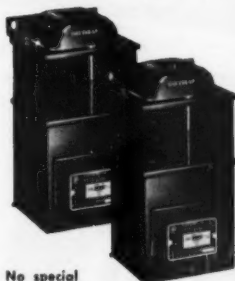
LARRY C. RODGERS, Secretary-Manager of the Portland Chapter of NECA, believes that the prestige of the association is constantly growing throughout the northwest.

FOR MODERN WIRING SYSTEMS



Use

JEFFERSON Dry Type TRANSFORMERS



No special vaults are required.

— Each transformer is complete with roomy wiring compartment having knockouts for rigid or flexible conduit connections.

Approved by Underwriters' Laboratories, Inc.

In new plants, present practice calls for distributing power at higher voltages—460 or 575 volts—and providing for the lower voltage circuits for lighting and operation of portable equipment by means of compact dry type transformers. Thousands of Jefferson Transformers have been installed for such purposes.

For motor driven machinery where low voltages are required for control, relays, etc. Jefferson Power Circuit Transformers are often mounted on the machine itself.

The cost of this method of distribution is reduced—by savings in copper, conduit and fittings. Further economy is realized as all power is bought through one entry and one meter.

STOCK SIZES:—50 V.A. to 15000 V.A.
460/230 Volt Pri.—230/115 Volt Sec.
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TIME SWITCHES

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Highest quality material and unexcelled craftsmanship combine to make Automatic Time Switches the preference of those who demand long life dependability backed by an unconditional guarantee.

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Stock Models: Single Circuit, Single Pole, 10 Amperes Capacity to Two Circuit, Four Pole, 45 Amperes Per Pole Capacity. Special models engineered to your requirements.

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"NOW HERE'S THE POINT . . ."

says George Sutherland to appreciative Joe Krivanek Jr., as NECA Oregon-Columbia Chapter members get together for an evening of non-competitive fellowship at the Longview (Washington) Country Club.

Electric Association, Alexandria; Minnesota Valley Cooperative Light & Power Association, Montevideo; Goodhue County Cooperative, Zumbrota; Wells Electric Association, Wells; Nobles Electric, Worthington; Wright-Hennepin Cooperative, Maple Lake; and Wild Rice Electric Cooperative at Mahanomen.

At a recent meeting between the Wright-Hennepin Coop and electrical contractors in that area, a progress report of that specific reinspection program was made. Revealed was the fact that 90 percent of the farms reinspected to date were either inadequately or improperly wired.

Severson Elected NDECA President

Wesley Severson of Valley City, North Dakota, was elected president of the North Dakota Electrical Contractors Association at the recent annual convention of that group. Arthur O. Holmes of Minot is the new vice president and L. C. Oeder, Bismarck, was re-elected secretary-treasurer.

Chosen to serve on the Board of Directors were: Chester Brown, Dickinson; Peter Tangen, Pekin; Herman Junge, West Fargo; A. E. Helbeling, Mandan; Leo Stemen, Burlington; and R. F. Bayer, Garrison. Representing the NDECA as Directors to the Midwest Electrical Council, Inc., are: Wesley Severson, L. C. Oeder, and Charles Wood of Fargo.

The three-day session was attended by approximately 150 registrants; had a conference agenda which included constructive talks and discussions on modern lighting, electrical heating, credit, and the electrical Code.

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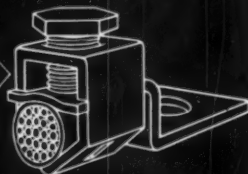
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Dates Ahead

International Association of Electrical Inspectors—Northwestern Section, Seattle, Wash., Sept. 11-13; Southwestern Section, San Jose, Calif., Sept. 18-20; Eastern Section, Hotel Statler, Buffalo, N. Y., Sept. 25-27; Western Section, Hotel Book Cadillac, Detroit, Mich., Oct. 2-4; and Southern Section, Daytona Beach, Fla., Oct. 16-18.

International Municipal Signal Assn.—55th Annual convention, Hotel Commodore, New York, N. Y., Sept. 18-21.

Essex Electrical League—Silver Anniversary Luncheon, Military Park Hotel, September 26.

Canadian Electrical Manufacturers Assn.—Annual meeting, General Brock Hotel, Niagara Falls, Ont., Sept. 27-29.

International Association of Electrical Leagues—Annual Conference, Copley Plaza Hotel, Boston, Mass., Oct. 11-14.

National Electrical Contractors Association—Annual convention, Hotel Biltmore, Los Angeles, Calif., Oct. 17-20.

National Farm Electrification Conference—Melbourne Hotel, St. Louis, Mo., October 18-20.

Illuminating Engineering Society—New York Section, Northeastern Regional Conference, Hotel Statler, New York, N. Y., October 26-27.

National Electrical Manufacturers Association—Chalfonte-Haddon Hall, Atlantic City, N. J., Nov. 13-16.

American Standards Association—Annual Meeting, Waldorf-Astoria Hotel, New York, N. Y., Nov. 27-29.

Plant Maintenance Show and Conference—Cleveland, Ohio, January 15-18.

International Heating and Ventilating Exposition—Commercial Museum, Philadelphia, Pa., January 22-26.

American Institute of Electrical Engineers—Winter General Meeting, New York, N. Y., Jan. 22-26, 1951.

National Electric Sign Association—Hotel New Yorker, New York, N. Y., February 5-7.

Edison Electric Institute—17th Annual sales conference, Edgewater Beach Hotel, Chicago, Ill., April 2-5.

Chamber of Commerce—39th Annual meeting, Washington, D. C., April 30-May 2.

National Fire Protection Association—Annual Meeting, Detroit, Mich., May 7-11.

Edison Electric Institute—Denver, Colo., June 4-7.

Illuminating Engineering Society—National Technical Conference, Hotel Shoreham, Washington, D. C., August 26-September 1.



ELECTRICAL CONTRACTORS Arthur R. Johnson (A. R. Johnson Co.) and Harold Ploense (Harold Electric Co.) get together for some friendly words at the summer social meeting of the Oregon-Columbia NECA Chapter.



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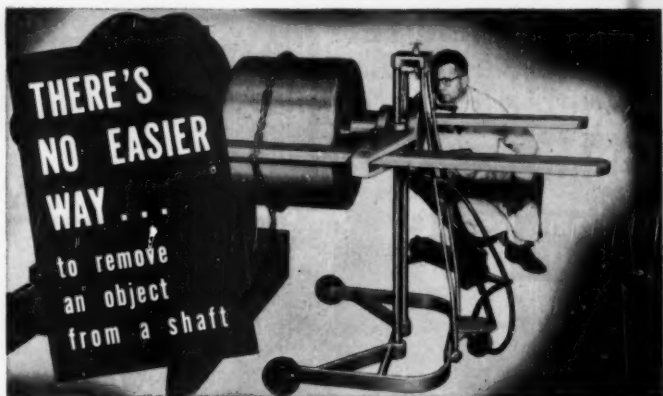
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The New, Improved Hydraulic PULLEY PULLER

Enables one man to remove a pulley, gear, pinion, or other object from a shaft in minutes! No crow bars, sledges, or blowtorches. No damage. Puller is adjustable, easily moved, rugged. Hundreds now in use in industry.

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Reliance Automatic Lighting Co.
1937 Mead Street Racine, Wisconsin



RENEWED SERVICE THROUGH MODERNIZATION

(FROM PAGE 57)

continuance of utility dc service in midtown Los Angeles.

To cause the least amount of interruption to elevator service while this changeover was in progress, each rewiring step was planned in advance. The new three-phase 240-volt switchboard and elevator power panel were first positioned. Conduit was then installed between power panel and machine room pull box, and between switchboard and the main elevator hallway. New junction boxes and cable supports were installed where required, and new 350-MCM subfeeders were pulled into position. The use of jumpers and the routing of elevator motor loads over other existing (but temporarily-disconnected) circuits rising through the building provided service during this transition period. After final connections were effected, temporary wiring was salvaged and the other permanent circuits were reconnected for service purposes.

The need for this modernization was recognized as the normal resultant of progress and expansion.

When the 10-story office building was erected in 1921, it was adequately wired—by then-existing standards. But 1921 was before the acceptance of 50-footcandles of general illumination, the introduction of air conditioning, the installation of electric business machines, water cooler, oil burners and high-speed elevators.

As these higher standards and new services came into being, the bank adopted them to keep pace with progress. Tenancy in the building also progressed—not by a modest fraction, but by nearly 300 percent—and indications are that future occupancy may exceed the present by another third.

While outward appearances indicated that the building was still modern, bank engineers and officials realized that modern innovations had dangerously overloaded the distribution system. Modernization was their answer.

Working together through the planning and execution of the program were electrical contractor George Young; engineer-architects Claud Beelman, Herman Spackler and Chauncey Mauk; Department of Water and Power consultants F. J. MacLaughlin and A. C. Hall; the Westinghouse Electric Corporation; and bank officials Herman F. Hahn, L. W. Cross and A. Horne.

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Portable
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Use Electric Tools on Every Job!

Speed the work, cut costs on installation and maintenance jobs. Lightweight Onan air-cooled electric plants supply electric power anywhere for lights, drills, saws, hammers, spades and other motor-driven tools. Equipped with carrying handles or dolly-mounted. Take 'em anywhere and plug in for all the power you need.

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A. C.: 350 to 35,000 watts.
D. C.: 750 to 15,000 watts.
Diesel plants: 2,500 to
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Model SCX, 5,000 watts D. C.
Weights only 315 lbs.



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ELECTRICAL SPECIALTIES

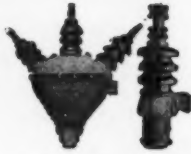
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MATERIALS • INSULATING COMPOUNDS



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14260 Birwood Avenue • Detroit, Mich.

ELECTRICAL PROBLEMS OF PLANT RELOCATION

[FROM PAGE 47]

liers were in use for powering plane components and starting aircraft engines. Capacities ranged from 25 to 200 amps., 28½ volts dc, with primary voltages of 110 volts or 208/220 volts. No conversion of 110-volt equipment was required. The 208/220 volt, three-phase equipment required a replacement transformer to provide proper secondary ac voltages to the rectifier banks. This conversion was not made because of the replacement transformer cost and the industry trend to regulate voltages for testing aircraft components. Such voltages cannot be obtained with rectifiers. The rectifiers are now supplying casual dc power requirements, where close voltage is not required, from the 120/208-volt lighting system. Motor-generator sets, with dc voltage automatically controlled by aircraft type carbon-pile regulators, are used for testing.

Approximately 75 temperature-control instruments required no conversion due to the installation of control circuit transformers.

A substantial list of special equipment such as blueprint machines, photographers' are light and laboratory equipment all employing odd voltages could not be reconnected for 480-volt operation. Conversion in each case was made by using dry-type power transformers. All of this equipment was installed in a newly-constructed building, and the grouping permitted two distribution systems supplied by two large transformers located in a substation vault near the load centers. One distribution system consists of a large power panel with branches supplying each machine. The laboratory area is supplied with 220 volts from a busduct running parallel to the existing 480-volt busduct.

The center of equipment conversion was an area near the shipping platform of the Connecticut plant especially set up, equipped and stocked for efficient operation. A 480-volt, three-phase feeder was installed for testing. Practically all equipment and machine tools were delivered here where all reconnections, rewiring, motor changing and other conversion chores were performed. The equipment was then shipped to Dallas and moved to location on the new plant floor, connected to the bus duct system and was ready for operation. Through carefully planned moving and repair scheduling, an electrical crew of 15 men handled the complete project.

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Certified

Cords and Cables

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Positive 3 Way Protection

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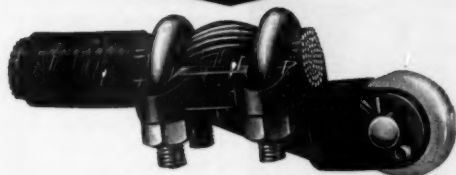
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BUS CIRCUITS GIVE LAYOUT FLEXIBILITY

[FROM PAGE 51]

ers, branch feeders are run to the overhead 50 amp., 250 volt bus (Trumbull's LTG Flex-A-Power) plug-in system which feeds the lighting equipment.

Energy is supplied to each continuous row of luminaires with one four-conductor, three-pole, flexible cable plug-in connection. The fourth conductor is used for grounding to the bus enclosure.

Grounded polarized receptacles were installed on all columns. Some are three-phase, 240 volt, fed from the overhead three-phase power network, and others are single-phase, 120/240 volt, fed from the circuit breaker panelboards on the secondary side of the dry-type transformers. These provide flexible power for portable tools and equipment over the entire floor area.

A number of factors were considered in the design and selection of the lighting system. These included: 1) the type of production that was to be carried on in the areas; 2) the height, width, location and use of the production machinery; 3) a detail study of different types of artificial illumination systems, to determine the lighting system that would produce the desired illumination level most efficiently and whose light distribution would meet the production requirements; 4) a study of the maintenance of the considered systems; and 5) the desirability of painting the production equipment and the walls and ceiling with paint having the proper reflection factor.

These studies resulted in the selection of continuous row porcelain enameled industrial reflector four-lamp fluorescent slimline lamp luminaires spaced on ten-foot centers. In high bay areas, the continuous rows were installed 19 feet from the floor, and the T-8 slimline lamps are operated at 300 ma. In low bay areas, the continuous rows were installed 15 feet above the floor, and the T-8 slimline lamps are operated at 200 ma. All are 4500-degree white, one inch in diameter. Wiring connections within the Miller luminaires are such that the two outside slimline lamps are on one circuit, and the two inside lamps are on another circuit, thus providing two intensities of illumination.

The initial lighting level was approximately 101 footcandles, and after more than six months' operation was

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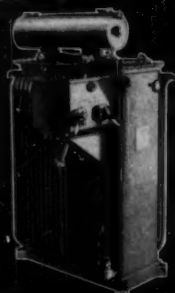
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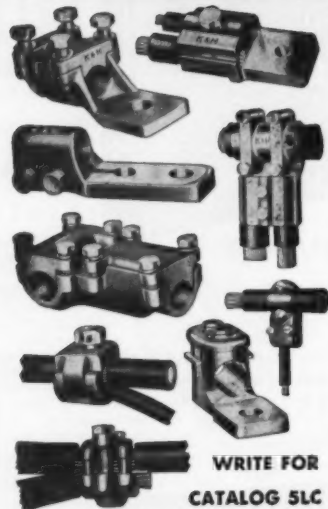
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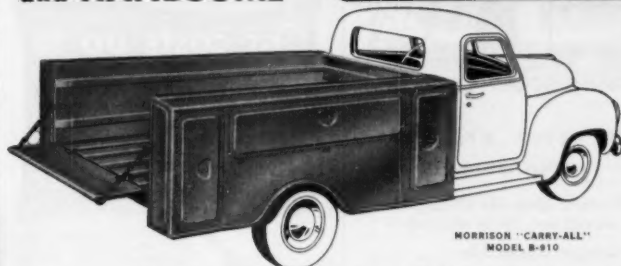
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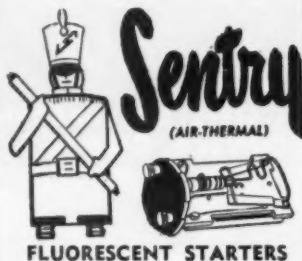
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[FROM PAGE 64]

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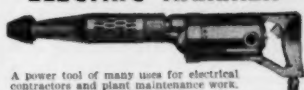
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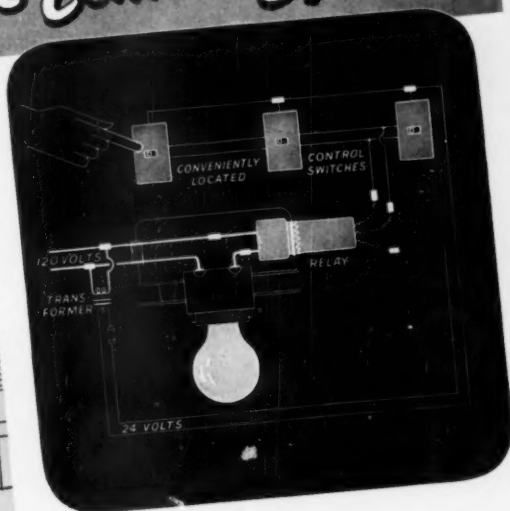
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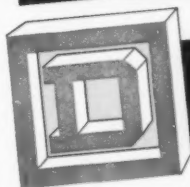
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 instead of conventional switching
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JOE, YOU CAN'T EXPECT TO KNOW ALL THE ANSWERS. BUT....IF YOU'RE GOING TO BE AN ESTIMATOR.... YOU'D BETTER LEARN WHERE TO GET THEM FAST!

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